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Transactions of the Australasian Medical Congress
(British Medical Association)

Second Session: Dunedin, February 3 to 10, 1927

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THE CLINICAL IMPORTANCE OF THE BASAL METABOLIC RATE IN GOITRE.

By FRED. T. BOWERBANK, O.B.E., M.D., M.R.C.P. (Edinburgh),
Wellington.

(*Continued from Page 64.*)

TAKING again the usual signs and symptoms of hyperthyreoidism, the pulse rate is one of the most valuable signs and yet as I shall demonstrate later on the screen, it does not always indicate the severity nor the progress of the disease. This is especially the case when the myocardium has become permanently affected, a condition which is much commoner than is generally recognized. For instance, there may be partial or complete heart block with a pulse rate of under eighty per minute. Auricular fibrillation, auricular flutter and paroxysmal tachycardia all indicate a toxic myocardium and in the majority of such patients even a cure of the hyperthyreoidism leaves a heart muscle permanently affected and liable to relapse into fibrillation and so forth. For this reason Sir James Berry considered an electrocardiogram equal in importance to estimation of the basal metabolic rate.(4) Loss of weight, another sign, is by no means constant. Nervous symptoms, tremors and the like do usually improve, but they are very difficult to assess. On the other hand, the basal metabolic rate when measured repeatedly, does assist materially in estimating the severity and progress of the disease. Plummer claims that in adenoma of the thyreoid with hyperthyreoidism the basal metabolic rate is not usually so high, but persists at a more uniform level than in exophthalmic goitre.(5) Then there is the aberrant type of myxœdema with enlarged thyreoid, nervous symptoms *et cetera*. The basal metabolic test will not only diagnose the true condition, but will also indicate the treatment.

In the third place it indicates the time to operate and the extent of the operation. Thyreoidectomy is, I understand, a comparatively simple operation and this, I consider, is one of the chief reasons for the high mortality rate. I have noticed that the more experienced the surgeon, the greater the respect he has for the thyreoid gland and with the increasing use of the basal metabolic test it has three operations on the one patient. After all, it become much commoner to perform two or even is better to take two or even three bites at a cherry than to risk being choked by the stone! A classification published by Frazier and Adler is used at the Wellington Hospital, namely, under 40% increase indicates a subtotal thyreoidectomy; from 40% to 70% indicates bilateral or unilateral ligature of the superior thyreoid arteries; when the increase is over 70% the condition is inoperable. Possibly there are surgeons who have that intuition which enables them to sense when they can safely operate, but such a gift is rare. If the surgeon has studied the patient's case, has watched the pulse rate, weight *et cetera* and yet has not carried out a series of basal metabolic rate tests, can he conscientiously feel that he has taken every precaution against failure and even disaster?

I should like to devote a few words to the methods employed for estimating the basal metabolic rate. In America they have elaborate instruments for this purpose, namely the calorimeter whereby the actual heat given off by the patient is estimated. Wonderful results and accuracy are claimed, but it is very costly and quite inaccessible even to hospital units in New Zealand. In most of the large hospitals in England and Scotland the open method is used, the Douglas bag and Haldane apparatus. The patient inhales the room air and exhales into a large bag for about twenty minutes. The amount of exhaled air is then estimated by means of a gasometer and samples are taken. Estimation of the oxygen and carbon dioxide is made and the basal metabolic rate is determined. I used this method in Edinburgh, but it is of practical use only in a large medical unit owing to the length of time required. The third or closed method as it is called, consists of a spirometer filled with oxygen. The patient inhales oxygen and the expired air returns into the spirometer through a cylinder containing soda lime which absorbs the carbon dioxide. There are several of these instruments, all on the same principle, and the one I have been using during the past fifteen months is a British Benedict, made by Kendrick, of London. I have made between five and six hundred estimations on about one hundred and thirty patients in the Wellington Hospital and outside and have found it very satisfactory for ordinary clinical use. It is, of course, not so accurate as the use of the more elaborate apparatus, but when properly used it gives dependable results. I would stress here, however, that the technique is most important and the whole

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test should be done under basal conditions. A hyperthyreoid patient has a very irritable sympathetic system and when he or she first sees the instrument he or she may be unduly apprehensive. For this reason for diagnostic purposes one examination alone is of no value and two or even three series of tests should be made on consecutive days. Much of the disrepute with which the basal metabolic rate was at first surrounded, was, I am sure, due to faulty technique. At the Wellington Hospital a trained nurse has been appointed as technician and she is now making basal metabolic tests on all patients with goître at regular intervals.

Some of the points I have emphasized are illustrated by the following summaries and charts.

Case Records.

CASE I.—Miss de L. is aged twenty-one years. The onset was acute, with tonsillitis early in January, 1926, followed by tachycardia and dyspnœa. There was a previous history of two attacks of tonsillitis. The thyreoid was smooth and systematically enlarged; exophthalmos, tremors, tachycardia and lassitude were present.

Chart I reveals an increase in the basal metabolic rate after tonsillectomy, without a corresponding rise in the pulse rate. The blood pressure remained variable. The weight underwent little variation; it was always above normal. There was a fall in the basal metabolic rate after thyreoidectomy, with a fall in the pulse rate to a lesser degree. According to a recent communication, there is now no palpitation; the patient feels better than she has done for years.

CASE II.—C.G., aged fifty-two years, was admitted for investigation. There was history of loss of weight, glycosuria, epigastric pain, tachycardia with intermittent paroxysmal auricular fibrillation and exophthalmos without other eye signs. No evident enlargement of thyreoid gland was detected. The glucose tolerance test yielded a normal response. X ray examination of the abdomen did not disclose any abnormality. On pathological examination of the gland it was seen that the greater part was normal. There were areas in which the epithelium was tall and hyperplastic. No parts corresponded to the usual histological appearances in exophthalmic goître.

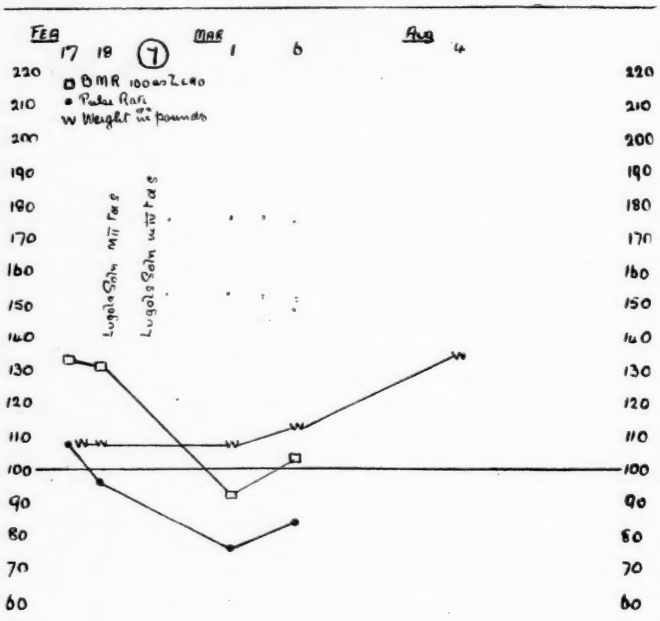

CHART VII.

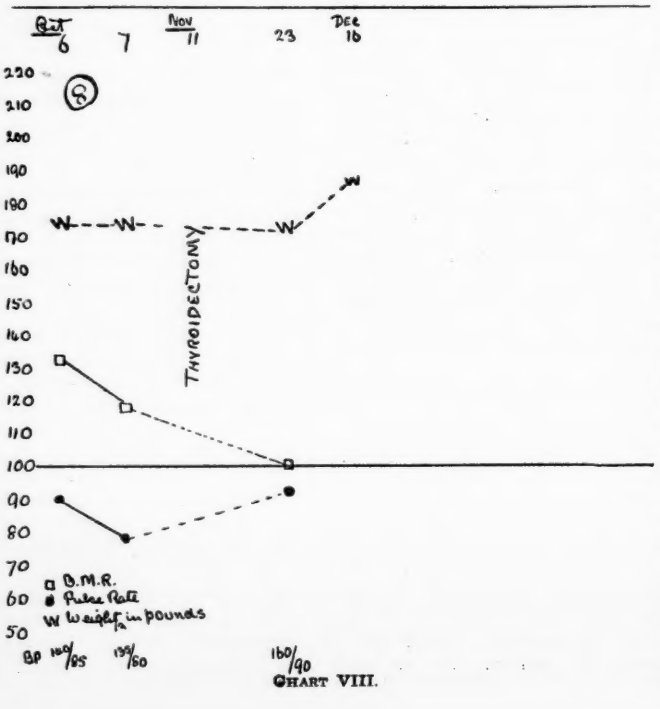

CHART VIII.

In Chart II the basal metabolic rate is shown. There was a rapid fall with medical treatment (strychnine and iodine), a temporary rise after thyreoidectomy, followed by a fall to normal. The pulse rate does not indicate the severity of hyperthyreoidism. The weight underwent a gradual and then a rapid rise.

CASE III.—Mrs. W., aged twenty-six years, had three children. Fullness in the neck was noticed fifteen months ago before her last confinement. Nine months ago there was a considerable increase in weight. Three months ago she was given thyreoid extract; this was followed by a fall in weight, but with the appearance of tremors, exophthalmos *et cetera*. On admission the signs were those of mild exophthalmic goître with slight increase of the thyreoid gland.

The greater part of the gland consisted of ordinary colloid goître. Scattered areas were seen in which the epithelium was actively hyperplastic; the cells were tightly packed and colloid scanty.

Chart III illustrates that the basal metabolic rate was much greater than was apparent by the signs and symptoms. There was a rapid temporary fall during treatment with iodine. The pulse rate varied little all through. The weight underwent but little change until after the operation. The blood pressure fell after the operation. The improvement in her general health was considerable and included the loss of tremors and of the nervous symptoms.

Case IV.—Miss P., aged fifty-seven years, was taken ill after a motor car accident six weeks ago. She had had a similar attack eight years ago. The nervous signs and symptoms included auricular fibrillation, persistent diarrhœa and vomiting and loss of weight. There was no evident enlargement of the thyreoid gland.

In Chart IV a fall in the basal metabolic rate is recognized after the administration of iodine, followed by rise after ligature of the superior thyreoid arteries with a subsequent fall. The pulse rate was variable and did not follow the changes in the basal metabolic rate. There was a temporary fall of the blood pressure.

Case V.—Miss R., aged seventeen years, had her onset three months ago. Her signs comprised nervous symptoms, loss of weight, loss of appetite, constipation, septic tonsils and diffuse enlargement of the thyreoid gland.

Chart V reveals a slight increase of the basal metabolic rate. No change occurred after tonsillectomy, but later a rise took place. Subsequently there was a fall to normal after thyreoidectomy. The pulse rate followed the basal metabolic rate to a certain extent. Little change of weight was registered and the blood pressure underwent slight increase.

Case VI.—Mrs. D., aged twenty-two years, dated the onset five years ago. The signs included intermittent headaches, shortness of breath, œdema of the ankles, giddiness. She had had rheumatic fever five years ago. Her tonsils were affected. There was no enlargement of the thyreoid gland. Tremors of the fingers and slight exophthalmos were noted. On August 12, 1926, there were no tremors and no exophthalmos. The patient felt very well.

Chart VI depicts the great increase in the basal metabolic rate. It fell to normal two months after enucleation of the tonsils. The pulse rate varied but little and did not follow the basal metabolic rate. There was a gradual increase of the diastolic blood pressure and a slight increase of the weight.

Case VII.—Mrs. C.W., was aged fifty years. The onset was uncertain. She had had a great shock twelve months ago. Hysterectomy had been performed four months ago. The climacteric had occurred two years ago. The signs and symptoms included nervous symptoms, lassitude, progressive loss of weight, but no evident enlargement of the thyreoid gland.

In Chart VII the definite increase of the basal metabolic rate is seen. It illustrates the result of iodine therapy. The pulse rate and blood pressure fell with the basal metabolic rate, while the weight increased progressively. On August 4, 1926, she wrote that she was feeling very well and that her weight had increased.

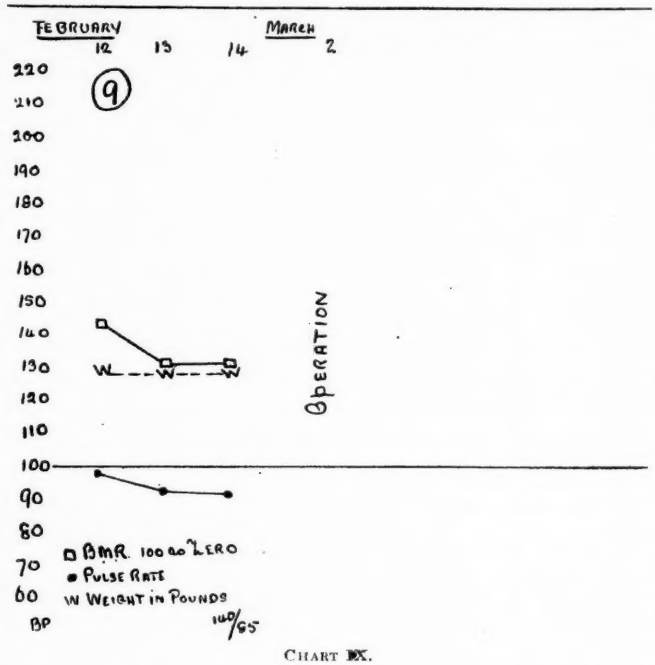

Chart IX.

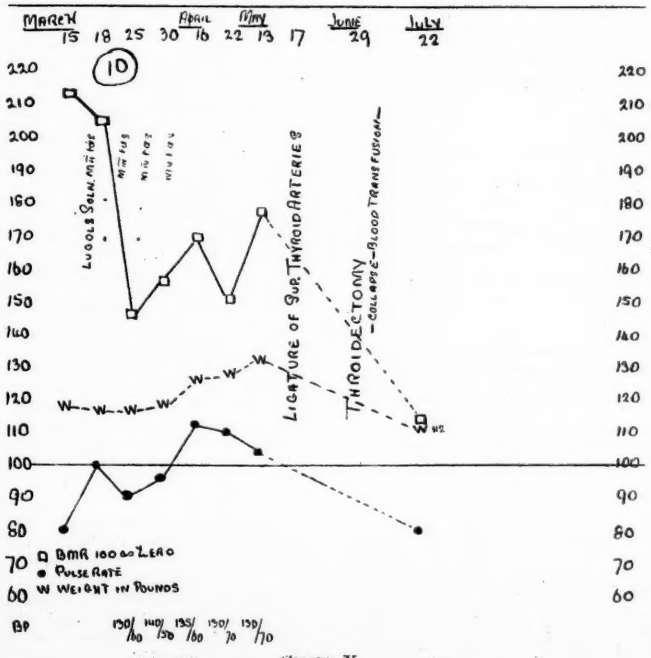

Chart X.

Case VIII.—The onset of the illness of Major G.A.G. had been gradual. About October, 1925, he noticed that he was losing weight. In December, 1925, he weighed eighty-two kilograms (thirteen stone); in March, 1926, he weighed seventy-four kilograms (eleven stone eleven pounds). He attributed his illness to a strenuous march while in camp. The signs and symptoms included coarse tremors of the hands, evident loss of weight, a pulse rate of 112, a systolic blood pressure of 135 millimetres and a diastolic pressure of 80 millimetres, no exophthalmos. There was no enlargement of the thyreoid on inspection, but the gland was palpable, that is that it was probably increased in size. Previous to admission the pulse rate had been between 100 and 114. He had been under medical treatment for some months with temporary improvement only. Since the operation there has been a remarkable improvement. When seen about six weeks after operation his weight had increased to eighty-five kilograms (thirteen and a half stone) and he stated that he could walk up hills without any sign of breathlessness or palpitation (see Chart VIII).

Case IX.—E.G.S., aged sixty-four years, had been under numerous doctors and had been treated for neurasthenia; he was getting worse. The time of the onset was uncertain.

certain. For some years he had complained of lack of energy, pains in his shoulders. The enlargement of the thyreoid had been noticed only a year ago. The signs and symptoms were as follows: He was very nervous and worried about himself, was full of his symptoms, was excitable and irritable; a typical picture of a neurasthenic. There was no exophthalmos. The thyreoid had a hard nodular enlargement in the right lobe, the size of a walnut. He was sent to me for an estimation of the basal metabolic rate. On three consecutive days it was 144, 131, 131 (100 as zero). He was then operated on and the right lobe was removed. Eight months after the operation he was full of energy and planning a trip to England and the Continent. The shooting pains in the shoulder and neck had disappeared (see Chart IX).

CASE X.—Mrs. H., aged thirty-one years, had not felt well since the birth of her child a year ago. Six months ago she noticed a swelling in her neck. The signs and symptoms included lassitude, nervous irritability, palpitation, œdema of her ankles. She was anæmic. Her thyreoid was greatly enlarged and very vascular. The condition was a colloid goitre with adenoma.

Chart X reveals a very high basal metabolic rate, with a temporary rapid fall and gradual increase. The pulse rate did not indicate the severity of the disease. I was unable to estimate the basal metabolic rate between the operations, owing to the nervous condition of the patient. Her weight underwent a steady increase until the operation. I have been unable to trace her since her discharge from hospital; she has not reported.

Summary.

The basal metabolic rate is the most consistent of all the signs and symptoms of hyperthyreoidism or thyreotoxicosis.

Taken in conjunction with the clinical signs and symptoms it is a valuable guide in diagnosis, in the progress of the disease and in estimating the time and extent of the operation if required.

A patient who gives a reading of over 115 (100 as zero) on two consecutive days, has hyperthyreoidism.

The closed method, under conditions explained in my paper, is eminently suitable for diagnostic and other purposes by medical men in town or country, owing to its ease of application and portability.

Its use, especially when operation is contemplated, will result in a lowered mortality rate.

References.

(1) G. E. Beaumont and E. C. Dodds: "Recent Advances in Medicine," 1926, page 190.
(2) E. C. Kendall: Selected papers of the Mayo Clinic, 1925, page 515.
(3) Census and Statistic Offices, New Zealand, 1926.
(4) J. Berry: *Proceedings of Royal Society of Medicine*, July, 1926.
(5) H. S. Plummer: Selected papers of the Mayo Clinic, 1925, page 520.

DR. F. V. BEVAN BROWN (Christchurch) said that he believed the active principle to be thyroxin and that the iodine portion of this substance was the active portion. The value of the thyreoid extract depended on its iodine content. The iodine molecule acted as an oxidizing agent in the body accelerating all the functions of the body. It maintained metabolism at a certain definite level. There was plenty of evidence that thyroxin exerted an antitoxic function. It did so by the virtue of its powers of oxidation. It also stimulated the defences of the body, the production of leucocytes and plasma and tissue antibodies. It also had a direct action on bacteria or their toxins. In alimentary toxæmia the presence in the bowel of excess of putrefactive material from bacterial action on protein food used up the iodine in the body. The supply of iodine in the body was thus reduced. In the case of infected tonsils and septic teeth the iodine was reduced in a similar manner. The demand for iodine in the body varied daily, hourly and according to the district, season and so forth. It did not follow, however, that if a person lived in a goitrous district, he would acquire a goitre. Extra demand was a great factor, but the toxic factor was also most important. They accepted the theory of iodine deficiency unreservedly, but there were other factors. Extra demand for thyreoid secretion, for example, by toxic infection in adults and by physiological demand in adolescence must be borne in mind by clinicians. He referred to a group of people between the ages of fifty and sixty who having led an active life, developed neurasthenia. Many of these were subthyreoidics and must be distinguished from the ordinary neurasthenic. These people, the subthyreoidics, often benefited by doses of thyreoid extract.

PROFESSOR A. M. DRENNAN (Dunedin) said that the basic cause of goitre was the lack of iodine, although he admitted that there were other but subsidiary factors. When the gland was exposed to a lack of iodine, it responded; hypertrophy of overwork occurred. The gland reacted in one of two ways: (i.) storage, (ii.) hyperplasia or secretion. Enlargement then took place. If iodine was given, there was mass effect and toxic goitre might result. Some parts might respond more than others, especially in the adenomatous type, with compensatory hypertrophy. The adenoma might assume one of two changes: (i.) storage of colloid, (ii.) hyperplasia or secretion. Fœtal adenoma was characterized by storage of colloid.

Goitres became clinical when there was too much secreting tissue for the size of the individual. Iodine given might result in an adenomatous toxic goitre. Surgery would have to step in to remove the "mass effect." This type of goitre frequently occurred in women from thirty to forty years of age. The goitre had probably been there since childhood; the demand lessened at a later age period and therefore the gland became overcompensated.

Degeneration and atrophy or other pathological changes might take place in hyperplastic or colloid nodules; hypothyreoidism and myxœdema might be an end result.

Another type of basic response might be diffuse hyperplasia. The gland poured out too much hormone and therefore it had no storage reserve. This type had been found *post mortem* in subjects of lymphatism with no thyreoid symptoms at all. If hyperplasia continued and there was no storage, the manufacturing area was increased and primary exophthalmic goitre would result. One end result of this might be that the tissues would become exhausted and death would occur. On the other hand myxœdema might occur. He said that Dr. Bowerbank had shown how the basal metabolic rate fell after the administration of iodine. The gland formed a storage head and therefore a hyperplastic gland must be removed before the basal metabolic rate would fall.

DR. F. FITCHETT (Dunedin) said that he would classify goitre into (i.) endemic, (a) diffuse colloid, (*b*) adenomatous (toxic and non-toxic); (ii.) exophthalmic. He agreed that iodine deficiency was the essential cause of goitre. Thyreoid enlargement occurred with iodine deficiency and he would attempt to give the reason. One function of the thyreoid gland was to maintain in the body fourteen milligrammes of thyroxin. To do this 0·33 milligramme must be excreted daily. The stimulus to the gland was the fall in thyroxin content in the body. When iodine deficiency occurred, there was a greater fall in thyroxin content in the body. The stimulus to the gland was intensified and this caused diffuse hyperplasia. Colloid was stored in excess and simple diffuse colloid goitre resulted. Goitre was the result of iodine deficiency acting on a gland whose efficiency was already impaired, for example, as by infective fevers or diseases of childhood.

This simple colloid goitre in its pure form did not concern practitioners to any considerable extent. It rarely became toxic and usually disappeared spontaneously about the age of twenty-five. In some cases the gland might contain adenomatous tissue, as Dr. Stawell had pointed out and in these cases treatment with iodine, such as potassium iodide, gave no response, but there might be response to thyreoid substance.

There might be further changes, the formation of new acini which might give rise to distinct tumours or diffuse growth. Their behaviour was interesting. As a rule, as Dr. Sewell had mentioned, these adenomatous tumours did not function by producing thyroxin. Later when degenerative processes had set in, thyroxin was formed and under provocation the gland supplied too much thyroxin and toxic symptoms occurred.

It might be assumed on this hypothesis that a person with adenomatous goître in a district with a low iodine supply would become toxic if he moved to a high iodine district. There was no evidence to prove this. If iodine was administered by practitioners for some other disease, for example, in the form of potassium iodide for bronchitis, toxicity might be excited. The presence of adenomatous formation in a simple goître might not be suspected and toxic symptoms might be produced by treatment with iodine.

DR. J. F. MACKEDDIE (Melbourne) said that the subject of the discussion was the metamorphosis of simple to toxic goître. He thought that another title would probably be more interesting to many present. He suggested that they might have discussed the establishment of toxic goître without the intervening stage of simple goître. Practitioners were often confronted with patients witn exophthalmic goître in whom there had been no previous simple goître; these were the conditions that worried practitioners. He thought that many important points might be missed by talking of the disease in terms of thyreoid. The disease was probably more widespread than this. He described it as a vicious circle with the thyreoid included in it.

He had been impressed at Rochester on seeing wards full of patients all admitted for one object. Plummer had distinguished between adenomatous toxic and true exophthalmic goître, but there was an extraordinary lack of difference of treatment.

When, however, toxicity was considered, other things had to be taken into account also. There might be only traces of toxicity and this toxic action might not play a very important part. He would state a case as an example. A patient had a fast pulse but not much exophthalmos. The electrographical cardiogram revealed the heart flutter. This had been present for many years. One would imagine that the basal metabolic rate had been high for that reason. Digitalis had been administered, the basal metabolic rate had fallen and the patient had become normal.

In reply Dr. Sewell said that he had not mentioned in his paper the basal metabolic rate, but he realized that it was of extreme importance. Determination of the basal metabolic rate carried out as a routine would lead to the avoidance of many mistakes.

Infections were certainly the starting point of many goîtres and these infections must be dealt with. If an adenoma began to hypertrophy, it became a foreign body and the only treatment was removal. This brought the basal metabolic rate down to normal, provided the heart was not seriously injured. Thyreoid extract was certainly the best treatment for diffuse colloid goître. Colloid goître was the effect of an overworked gland and thyroxin was very useful. In some cases given intravenously the results were dramatic.

Dr. Tebbutt said that Dr. Drennan had pointed out that hyperplasia sometimes went on to atrophy and myxœdema resulted. That was Marine's view, but he thought that very few cases of myxœdema arose in this way. In the majority of cases there was no preceding toxic goître or hyperplasia. Some speakers had passed over the question of adenomata. There was no question that adenomata were neoplasms; they should not be confused with normal hyperplastic thyreoid tissue. Other criteria of tumour formation were absence of trabecular arrangement, a different type of connective tissue and thin walled blood vessels quite unlike those of the normal thyreoid gland.

In replying to Dr. MacKeddie, Dr. Bowerbank said that the case of auricular flutter mentioned might have been an anxiety neurosis and hence the cure of the flutter would lower the basal metabolic rate.

SECTION II.—SURGERY.

SURGICAL ASPECTS OF GOÎTRE.

By BASIL KILVINGTON, M.D., Ch.M. (Melbourne).
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THE surgical treatment of goîtres centres mainly around those enlargements associated with toxic symptoms and of these there are two main types. These are the exophthalmic and the hyperfunctioning adenomata. There are also mixed cases in which colloid thyreoid glands show toxic results either with or without adenoma formation.

Toxic goîtres with the exception of the very mild forms have now become entirely a surgical problem. Though we do not understand much of the causation, the best results are obtained by regarding the condition as one of overdose and removing the major portion of the gland tissue. This is not altogether satisfactory, as in the exophthalmic type, the secretion is probably abnormal in character as well as excessive in amount and after resection the patients are occasionally found to exhibit varying degrees of myxœdema and toxicity.

The results of medical treatment are unsatisfactory. This consists mainly of rest and iodine in some form; as soon as these are stopped, the symptoms recur.

An analysis of the cases at the Melbourne Hospital during the last five years bears this out.

Forty-one patients with exophthalmic goître were treated in the medical wards with eight deaths, that is 20%. In the last two years no patients have been treated medically beyond the preliminary and investigation stage. Two of these eighty patients would have died in any case. One died of pulmonary œdema and a chronic nephritis and the other died within three days of admission. Probably the majority of these patients would relapse after leaving the hospital.

During the same period ninety-two patients were treated surgically and six died, that is about 7%. With the improvements in preparation and technique the mortality has been reduced by 50% in the last two years to what obtained in the previous three years. The cause of this improvement I attribute to (i.) the routine administration of iodine in the form of Lugol's solution before operation, (ii.) the improvement in anæsthesia; nitrous oxide and oxygen is used as a routine, (iii.) the rule of operating in several stages which should be a *sine qua non* in a severe case.

In the Mayo Clinic the operative procedure has been perfected so that the mortality in the exophthalmic cases (700) has been reduced to 0·8%.

In the toxic adenomata the mortality is greater, reaching little over 1% in nearly 400 cases.

The gravity of a patient's condition in toxic goître is estimated by the cardiac condition and pulse rate and by the rise in the basic metabolic rate, anything over + 50% being a severe poisoning. The

presence of gastro-intestinal toxic symptoms and definite mental restlessness are also of bad omen.

Rest in bed for two weeks and an average dose of 0.6 mil. (ten minims) of Lugol's solution three times a day are ordered, though in bad cases up to 1.8 mils three times a day or sodium iodide intravenously may be administered.

The Choice of Anæsthetic.

Local anæsthesia has not been used at the Melbourne Hospital for goîtres.

Mortality with the Various Anæsthetics.

Under gas and oxygen anæsthesia the mortality was 3%. Under ether administered by the open method it was 10%. Under ether given by the intratracheal route it was 17%. This last method is very convenient at the operation, but is often followed by tracheitis and mucus in the lungs. Personally I have given it up.

The conclusion to be drawn is that where gas is not available, and the condition is a mild case, ether by the open method may be tried. For patients with severe affection only gas and oxygen should be used. Of course in these conditions chloroform should be banned.

The Performance of the Operation in Stages.

Our statistics show that the mortality when the excess of thyreoid tissue was removed in one stage was double that attending removal at two operations.

The patient naturally wishes to be spared a second anæsthesia, but this could be justified only in a mild case.

Patients are much improved after a single lobectomy, but should always be urged to have portion of the second side removed. The only exceptions to this are where toxic adenomata are confined to one lobe and when a single lobectomy has been followed by a recurrent nerve paralysis. If one lobe be left, this usually enlarges by gradual stages, with recrudescence of the symptoms which have never altogether disappeared. Indeed, even when only a portion of one lobe has been left, symptoms may recur with enlargement of the remnant. I have seen two patients recently in whom this happened after six and eight years respectively.

The Causes of Death After Operation.

Death may take place on the table or within forty-eight hours of the operation. In 75% of the patients death was due to thyreoid toxæmia with rapid pulse, cyanosis and pulmonary œdema associated with numerous râles in the chest. The prevention of this consists in a preliminary course of iodine treatment and its continuance for some days subsequent to operation.

Among the remaining 25% double recurrent paralysis was encountered in two. *Post mortem* examination showed this to be due to anatomical division in one. In the other the nerves were swollen, but not divided.

The remedy for this appears to be the leaving of a strip at the posterior surface of the gland, the nerves themselves not being seen. It is to be remembered that a dislocation of a lobe may produce a physiological lesion of the nerve.

The superior and inferior thyreoid vessels should be tied and the Spencer Wells forceps clipped into the back of the lobe which is cut in front of these.

One of the deaths was caused or accelerated by a hæmorrhage which took place from a ligature slipping shortly after the patient returned to bed.

One interesting fatality occurred from tetany, which supervened after the second lobectomy. The spasms were at first kept in check by administration of calcium chloride intravenously. The patient went out of hospital for three months and returned with the carpo-pedal spasms which were resistant to calcium.

In this group probably the only preventible fatalities were those due to the recurrent laryngeal nerve paralysis.

Many of the toxic thyreoid glands, especially the exophthalmic variety, are associated with septic foci usually in the teeth. When the condition is fully established, removal of these foci does not seem to influence the goître. This was the unanimous opinion expressed in a discussion by the members of the hospital staff.

The treatment of toxic goître is based on the same principles as that of exophthalmic goître. As a rule the patient has had a nodule in the gland for many years; Plummer fixes the average at fifteen years. The subjects are definitely older and consequently more prone to visceral changes, cardiac and renal; hence the greater mortality among them.

A certain number do not respond to Lugol's solution and I have even seen toxic symptoms commence apparently from the administration of iodine.

This lends support to Plummer's hypothesis that the poison in adenomata is ordinary thyroxin with the molecule fully saturated with iodine, while in the exophthalmic cases the exciting agent is an abnormal type of secretion deficient in iodine.

The goîtres that give rise to the greatest amount of anxiety are those intensely toxic ones, when the pulse is extremely rapid, perhaps with auricular fibrillation, the basic rate high and the patient extremely restless, perhaps almost maniacal. I have seen a patient with this type of condition who did not respond to Lugol's solution, though it was not given in the large doses one would now administer and who died from heart failure and pulmonary œdema ten days after ligature of both superior thyreoid vessels. Occasionally we meet patients who are so ill that it is impossible to perform any operation with safety. Looking through the records of fatal medical cases there appear three in this group. One patient died of cardiac failure, chronic nephritis and pulmonary œdema. The pathologist made a note of "non-operable."

A second died forty-eight hours after admission from fatty heart and toxæmia. A third died from

toxic myocarditis; she had also a double parotid abscess.

None of these three, however, is noted as having received iodine medicinally.

Two other methods of treatment are described, the use of X rays and preliminary ligature of the superior thyreoid vessels.

Personally I have not seen any benefit from X ray treatment, though possibly these patients do not come my way. I certainly think subsequent operation is rendered more difficult from fibrosis round the lobe.

In the Melbourne Hospital records only three cases of this are recorded; one patient was treated for six months without improvement, one died after being treated for six months and a third was relapsing after thirteen exposures. These are perhaps too few to justify a dogmatic statement, but they agree with what Dr. Mayo told me, namely, that they have discarded this treatment at his clinic. Preliminary ligature of vessels is still recommended as a preliminary in very bad cases. I have never been satisfied with its value and it is difficult to understand its action. It has been performed on two cases at the hospital under local anæsthesia, and gas and oxygen respectively. In neither patient did any benefit follow, though both left the institution without further treatment. I have done it twice myself, once on the hypertoxic patient I mentioned before who died ten days later. The second was also a very sick man. Some slight benefit apparently resulted and later on a double lobectomy was done in two stages.

During the last twelve months it has not been performed at the hospital. With very little added trauma a single lobectomy could have been done.

To sum up the main points I wish to emphasize: (i.) Toxic goîtres (beyond some very mild cases) are surgical problems, (ii.) with proper precautions the operative risk in thyreoid surgery is only about the same as that of other major operations.

These precautions are: (*a*) Preliminary rest and treatment with iodine; the dose of this varies with the toxicity; (*b*) the anæsthetic should be nitrous oxide and oxygen; (*c*) in all but exceptional cases no attempt should be made to remove all the necessary thyreoid tissue at one operation.

A single lobectomy, though it may improve the patient greatly, is never sufficient. Often the patient herself is satisfied, but she should be urged to have a further operation performed. Removal of a single lobe is always followed by a slow relapse of symptoms and this may result some years after the removal of the greater part of the thyreoid tissue. (*d*) A small amount of thyreoid tissue should be left. This should be the posterior strip of the lobes, since its distribution minimizes the risk of traction and damage to the recurrent laryngeal nerves.

An exception may be made to the rule that more than one lobe should be removed when a hyperfunctioning adenoma is single or if multiple when the nodules are confined to one side.

THE VALUE OF OBSERVATIONS OF THE BASAL METABOLISM IN THE SURGICAL MANAGEMENT OF GOÎTRE.

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THE word metabolism was first used according to Bayliss by Michael Foster. Bayliss[1] defines the term as expressing those chemical changes which take place in the various foodstuffs after they have passed from the alimentary canal into the blood. Christie[2] uses the word in a broader sense to cover all physico-chemical changes which go on in the living organism. Of the great majority of these changes nothing is known. The whole system requires a certain supply of energy in order to continue to work. This amount may be determined in various ways, the most convenient from the clinical point of view being that of indirect calorimetry.

The basal metabolic rate for any organism is the minimum rate of change which can be induced by the exclusion of factors which normally tend to speed up the metabolism. These factors are digestion, exercise, excitement and menstruation. At the time of estimation of the metabolic rate the state of the subject should approach that attained in peaceful sleep some twelve hours after the last meal. Normally the basal metabolic rate when properly estimated (and several estimations on different days may be necessary to arrive at a reliable reading) should fall within certain limits. In disease it may be increased or decreased and so fall outside these limits.

The Influence of the Thyreoid Gland.

The thyreoid gland apparently produces a substance which, when present in the blood, has the property of increasing the general rate of change in the body, that is the property of augmenting the rate of metabolism. In disease of the thyreoid gland the secretion may be deficient or absent or increased above the normal. When there is no thyreoid secretion, the basal metabolic rate falls to about 40% below normal and the organism exists at a very low level, both mental and physico-chemical activity being depressed to an extraordinary degree. In illustration of this state may be quoted the following:

CASE I.—A nurse, aged forty years, who until about four years prior to admission enjoyed remarkably good health and spirits, became highly strung and changed mentally, complaining also of palpitations. She lost weight, but after a time regained fair health. Six months before admission her manner altered again. Both her mental and bodily activity became depressed. Her hands, feet and eyelids became puffy. When first examined she was lying in bed in a drowsy state, taking no interest in her surroundings and only responding to shouted questions with an occasional monosyllable. Her hair was dry and coarse, her skin opaque, dry and thick in appearance, the hands clumsy looking and the eyelids heavy. She breathed at the rate of five respirations to the minute, her heart beating at the rate of about sixty to the minute. The basal metabolic rate was found to be 33% below normal.

After a short course of thyreoid medication operation was undertaken and a portion of a thyreoid gland removed from a patient with Graves's disease was implanted in slices in the rectus sheath. Immediate improvement in the patient's general condition followed, but unfortunately the wound became infected and probably all of the implanted tissue sloughed. Five days after operation the basal metabolic rate had risen to 8% above normal. A week later thyreoid extract medication was again commenced, the dose being increased up to 0·54 gramme (nine grains) daily and later decreased. Five weeks after operation the basal metabolic rate was 7% below normal. When last seen seven months after operation, she was bright and well again. She was then taking 0·12 gramme (two grains) of thyreoid extract daily.

Lesser degrees of deficiency are associated with lesser changes in the same direction. The administration of extract of the thyreoid gland causes an increase in the rate of metabolism and a return of the normal functioning of mind and body. Surgery is not related to the state of subthyreoidism except occasionally in the rôle of excitor, when operative interference destroys too much of the thyreoid gland and in a more or less experimental way for the implantation of thyreoid grafts as a therapeutic measure.

Hyperthyreoidism.

A persistent increase in the amount of thyreoid activity exists in the well known syndromes generally entitled exophthalmic goître and toxic adenoma of the thyreoid gland. It is not necessary to take into account at this stage whether the fundamental fault is in the thyreoid gland or not. In any case it seems clear that it is the abnormally increased amount of thyreoid secretion which is responsible for the increased rate of change throughout the body. Whilst this excessive rate is maintained, the body tissues in general are driven at excess speed, never resting to allow of repair or as Crile puts it, recharging of the batteries. In other words the basal metabolic rate is increased, it may be to 100% or more above the normal rate. The basal metabolic rate will not return to normal until the output of thyreoid secretion falls to normal.

Estimations of the Basal Metabolic Rate in the Clinic.

Apart from the interest derived from this comprehensive method of measuring the sum total of changes going on in the body, determinations of the basal metabolic rate may be useful in (i.) diagnosis and (ii.) control of treatment.

Diagnosis.

In many cases the diagnosis is not in doubt and basal metabolic rate estimations are to be regarded as in the nature of a luxury. There are, however, many so-called borderline cases in which the diagnosis is not clear and here the accurate measurement of the vital change may establish the diagnosis and direct treatment. It may not be out of place here to emphasize again the importance of repeated observations to confirm any abnormality that may be detected at the first experiment. The possible presence of other pathological states which cause abnormalities in the rate of metabolism, must of course be considered. None of these conditions compares with hyperthyreoidism either as regards the degree or the persistence of the upset to be observed. Chief amongst them are fevers, anæmias, *diabetes mellitus*, pituitary disorders, uncompensated cardiac lesions and asthma.

It is common knowledge that in many cases of exophthalmic goître the classical signs may be but poorly represented. The eyes may be normal; there may be but little change in the clinical appearance of the thyreoid gland and so on. Thus it comes about that the clinician is puzzled at times and unable, unaided, to dogmatize as to the cause of the condition confronting him. In such a dilemma he will welcome the aid to be derived from a study of the basal metabolic rate and indeed on this study the diagnosis and treatment will be based.

The following two case notes will illustrate, from different aspects, the value of the method.

CASE II.—Miss K., aged thirty-five years, after the death of her sister eight years previously, became nervy and complained of palpitations. She lost weight and appetite and her hands became shaky. There was apparently never any abnormality of the eyes or thyreoid region. After a couple of years partial thyreoidectomy was performed by one of Melbourne's leading surgeons. Improvement followed for a time, but not good health. When first seen by the author, she was in much the same state as prior to the operation. On account of the improvement already mentioned as following on resection, a further operation was contemplated. A study of the basal metabolic rate, however, disclosed no abnormality. The idea of surgical interference was therefore abandoned.

Several points in this history are of interest. First, the appetite was not good. Usually in cases of hyperthyreoidism the food intake is large as a necessary corollary to the high rate of metabolism. Secondly the improvement after the operation was probably due to rest and the psychic effect. Lastly had the basal metabolic rate been ascertained prior to operation, this latter would have been avoided.

CASE III.—A nurse, aged forty-five years, complained that after a strenuous day about three months previously she became conscious of her heart's action. As time passed this become more evident. She lost a little weight and became nervy. She had noted previously a slight enlargement of the thyreoid gland. She was put to bed and observed for a short period. Her heart was enlarged, the apex beat being ten centimetres (four inches) from the mid-line in the sixth intercostal interspace. A systolic murmur could be heard most intensely in the mitral area. The pulse was regular and varied in rate from sixty-eight to eighty per minute. There was a fine tremor of the hands, but no abnormality of the eyes could be detected. She was seen by several physicians, most of whom strongly influenced by the absence of increase in the pulse rate, pronounced against hyperthyreoidism as a probable diagnosis. The basal metabolic rate was found to be 38% above normal. Operation was undertaken and the patient has so far done well. The pathologist's report in brief was as follows: "Highly toxic goître."

Control of Treatment.

In *diabetes mellitus* treatment is controlled and checked by observations of the sugar content of the blood and urine, as representing the fundamental register for this disease. The register as regards thyreoid disorders is the basal metabolic rate. Only keep this rate within normal limits and no harm will result to the organism. Any form of treatment which does not attain this end, is imperfect. The most certain and effective way of reducing the metabolic rate in cases of hyperthyreoidism is to remove portion of the thyreoid gland and so reduce the

output of thyreoid secretion. Other recognized but less effective methods are two, rest and radiotherapy. Treatment with either of these methods should not be prolonged beyond say six months, unless definite improvement follows and is continuing, otherwise much harm may result to the heart and other tissues. The effect of the treatment is most accurately gauged by studies of the metabolic rate from time to time. If only partial success is attained, operative treatment should be undertaken. Prior to operation every effort should be made to improve the condition of the patient by means of rest, Lugol's solution, digitalis *et cetera*. Frequent studies of the basal metabolic rate will indicate when a good response to treatment has been attained and the time of operation can then be arranged.

Theoretically it would seem that a high preoperative basal metabolic rate would foreshadow a stormy postoperative course and would therefore call for a "staged" operation, possibly preliminary ligature, next lobectomy and later further partial lobectomy. In general this theoretical consideration holds, but with numerous exceptions. Thus occasionally a patient with only a moderately increased rate of metabolism is greatly upset by any operative interference, whilst sometimes on the other hand the converse is observed.

After operation it is desirable to observe patients for many months or years, in cases of exophthalmic goitre especially. Many of the signs and symptoms of the original disease persist after operation. Thus the eyes may continue to bulge and the heart to hurry. Is the thyreoid still over-secreting or are these phenomena a legacy of a disease now extinct? It may be difficult to decide on clinical grounds. An estimation of the basal metabolic rate, the fundamental measurement, will decide the question and also point the way for treatment. Commonly after resection of one lobe there is a very manifest improvement in the condition of the patient, but later a return of symptoms is illustrated by the following case. As a rule a subtotal resection should be aimed at.

Case IV.—Miss A.S., a Jewess, aged thirty years, ten years ago had noticed that her eyes had become prominent and that she was losing weight. She had not been well for some years and at the age of twenty-seven, seven years after the onset of symptoms, she had been subjected to operation by Mr. T. P. Dunhill. The left lobe of the thyreoid gland which extended behind the sternum was removed. Following this procedure there was a very great improvement in the patient's condition. She put on weight, the exophthalmos lessened in degree and she felt much better generally for more than two years. She once more began to lose weight, palpitations returned, she became short of breath and unable to exert herself. Under medical treatment she improved slightly, but was never free from symptoms. At the end of some months operative treatment being declined, a course of deep X ray therapy was instituted. The basal metabolic rate dropped from 30% above normal to the normal rate after two exposures. The patient's general condition rapidly improved.

References.

(1) Bayliss: "Principles of General Physiology," First Edition, page 263.

(2) Christie: "The Thyreoid Gland," Clinics of George W. Crile and Associates, page 142.

SURGICAL ASPECTS OF GOITRE.

By J. Guthrie, M.B., B.S. (Glasgow), F.R.C.S.E., *Christchurch*.

The goitres which enter the surgeon's field, are in my opinion all adenomata, toxic or otherwise, or exophthalmic goitre. I consider that all adenomata consistently tend toward the production of toxic symptoms and damage to the myocardium after periods of even thirty or forty years; many by subsequent growth produce pressure symptoms at a period of life when operation may be less safe.

It is necessary to distinguish clearly between simple and exophthalmic goitre, so that we may know beforehand what our operative findings are going to be and may be able to guard against unnecessary dislocation of a lobe. It may be necessary to search for adenomata, but this should usually be unnecessary and avoidable in a case of exophthalmic goitre.

It is my practice, therefore, to pay particular attention to the following points as set out by Searles, of California.

	Exophthalmic Goitre.	*Adenoma.*
1.	Exophthalmos in 70%.	No exophthalmos.
2.	Thrill and bruit.	No thrill nor bruit.
3.	Symmetrical and uniform swelling of tumour, limited size.	Asymmetrical and nodulated tumour growing to any size.
4.	Parallel goitre and toxic development.	Goitre for years before toxic symptoms.
5.	Rapid development with intermissions.	Slow progress to moderate toxic symptoms.
6.	Ætiology: often psychic with oral sepsis.	Endemic.
7.	Blood pressure 140/60 millimetres of mercury, always low.	Blood pressure 160/170 millimetres of mercury.
8.	Basal metabolic rate 40% to 70%, always high.	Basal metabolic rate 25% to 50%, moderately raised.
9.	Lymphocytosis, perhaps 40%.	Normal blood picture.
10.	Rarely substernal or intrathoracic.	Most substernal or intrathoracic goitres are adenomatous.
11.	Rarely pressure signs.	Pressure signs are a usual feature.

Operation.

Position.—The body is well raised at the head and shoulders. This position is far the best for ether administration by the open method which I always use. There is no embarrassment of respiration through pressure on the diaphragm. I have never had any trouble on the table with this anæsthetic given in this position.

Division of strap muscles (sterno-hyoid and sterno-thyreoid) in most cases is necessary for ease of access to the superior vessels.

The recurrent nerves are protected by keeping in front of the posterior part of the capsule, by placing forceps parallel with the trachea and by clamping them close to the gland, the closer the better.

Drainage is always necessary to guard against pressure on the trachea in the event of hæmorrhage and to avoid the development of hæmatomata and the worse contingency of accumulated secretions

in exophthalmic cases. The surgeon must keep close to the lower pole of the gland in clamping the inferior thyreoid vessels so as not to interfere with the blood supply of the parathyreoids. Another reason was furnished by Stiles in his report of two cases. After death following the operation he found that thrombosis had occurred extending directly into the innominate vein from the inferior thyreoid vein.

Lugol's iodine solution is given before and after operation in exophthalmic goître, but not in cases of toxic adenomata when it is dangerous. Cod liver oil is equally efficacious.

A case of severe tetany occurred in my practice when a large adenomatous gland was almost entirely removed, measuring fifty centimetres (nineteen inches) in circumference. Calcium lactate and parathyreoid extract were given for six months after with gratifying results. I also grafted a parathyreoid between the intercostal muscles. This patient was relieved by this treatment and remained well after it was discontinued and has been in normal health for six years. She had a return three months after discharge due to the tablets having become mouldy through damp. On being supplied with fresh tablets she was at once relieved.

I find that cretinism and hypothyreoidism are extremely rare in New Zealand, a fact for which it is hard to account.

THE BASAL METABOLIC RATE AND THE SURGICAL TREATMENT OF GOITRE.

By E. GORDON ANDERSON, M.B., B.S. (Durham), F.R.C.S. (Edinburgh),
Wellington.

PEMBERTON in the Mayo publications quotes Samuel P. Gross as having made a statement in 1866 to the effect that even should a thyreoid tumour producing suffocation not yield to non-operative, curative measures, no honest or sensible surgeon would attempt its removal, owing to its invariably fatal result. Here some sixty-one years later, owing to the pioneer work of eminent medical men who have come and many of them gone, such advances have been made in thyreoid surgery that most thyreoid conditions necessitating surgical intervention can be undertaken with a fair degree of safety.

These advances have proceeded along four lines: (i) A more understanding knowledge of the anatomy and physiology of the gland and its immediate surroundings, (ii) improved modes of anæsthetizing, (iii) improved surgical technique with (*a*) asepsis, (*b*) lessened bleeding, (*c*) greater care of the parathyreoids and the recurrent nerves, (*d*) leaving behind an adequate amount of thyreoid tissue to carry on the thyreoid function, (iv) improved preoperative and postoperative treatment.

Goîtres may be divided into the non-toxic: (*a*) colloid and adolescent goître, (*b*) non-toxic adenomata; toxic: (*a*) toxic adenomata, (*b*) exophthalmic goître; neoplastic carcinoma of the thyreoid.

What is the origin of adenomata? Whether they arise from fœtal remnants or develope from the loose, irregularly grouped cells within the thyreoid stroma which do not seem to enter into the acini, we do not know, but they tend to produce thyroxin when some ten to fifteen years after their formation they start to function.

Unlike the normal gland which has a delicately balanced nervous control and pays out thyroxin according to the body needs, adenomata keep up a continuous supply of thyroxin without remission and ultimately cause visceral degeneration with heart irregularity and auricular fibrillation.

On the other hand, in exophthalmic goître the gland seems to be stimulated by some unknown extraglandular stimulus to produce thyroxin in excess. The gland works at greater speed, builds extensions, increases its blood supply, but so great is the demand that it is forced to throw out an incomplete, probably iodine-free prothyroxin, which prothyroxin seems to produce the nervous symptoms and exophthalmos.

The administration of iodine converts this prothyroxin which is a short-lived product, into the more stable and less toxic thyroxin and thus leads to an amelioration of symptoms.

This iodine must be administered in moderately large doses, as it seems that although only small amounts of iodine are made use of, the thyreoid has difficulty in exophthalmic goître in separating out the iodine unless it be present in excess.

The use of iodine, as introduced by Henry Plummer in 1922, in exophthalmic goître, prior to operation, forcing it to six mils (one hundred minims) of Lugol's solution daily during the crisis and keeping on with iodine for three months after operation, has made the surgery of exophthalmic goître very much safer and has reduced the postoperative storm.

The anæsthesia may be induced by gas and oxygen and local anæsthesia or by local anæsthesia alone or by ether with premedication with morphine and scopolamine. Each have their advocates. I find that morphine, fifteen milligrammes (a quarter of a grain), scopolamine, 0·6 milligramme (one-hundredth of a grain) and atropine, 0·6 milligramme (one-hundredth of a grain), given one and a half hours before and scopolamine, 0·3 milligramme (one-two hundredth of a grain), half hour before with light ether inhalation gives a very satisfactory anæsthesia for the majority of patients.

Theory of the Cause of Exophthalmic Goître.

Is exophthalmic goître primarily a disease of the sympathetic nervous system in which the thyreoid and adrenals *et cetera* are secondarily involved, and thus treatment directed purely to the thyreoid gland, such as the surgical removal of greater part of the thyreoid, is starting at the wrong end?

The surgeon fully recognizes that hyperthyreoidism is intimately linked up with the sympathetic

nervous system and there may even be a huge ganglion along its course, but the dramatic improvement seen after adequate removal of thyreoid tissue in patients very toxic indeed and with nervous and circulatory systems very much involved, forces him to the conclusion that in hyperfunctioning adenomata of thyreoid, exophthalmic goître so called, the thyreoid is far and away the chief factor in the malady.

After adequate removal the pulse rapidly settles, the nervous manifestations subside, the patient puts on weight, the basal metabolic rate approaches normal and the patient becomes a more normal being.

In regard to iodine in hyperthyreoidism of the exophthalmic type, it seems to be to the thyreo-iodine complex what calcium is to the thrombin complex. It seems to be a katalytic agent which enables a prothyreo-iodine to be converted into a thyreo-iodine. In Graves's disease the prothyreo-iodine or incomplete product is thrown out into circulation during iodine deficiency, in the same way as incomplete cells are thrown out in pernicious anæmia. This prothyreo-iodine seems to be the causative agent at work in producing the symptoms peculiar to Graves's disease.

The effect of iodine medication varies with the amount of prothyreo-iodine being thrown out.

In adenomatosis of the thyreoid it seems that adenomata must be present for some ten to fifteen years ere they cause toxic symptoms. They then as a result of some unknown stimulus may produce a purely hyperthyreoidism syndrome producing normal thyreo-iodine, but, unlike the normal thyreoid, having an absence of nervous control or very poorly developed nervous control, they flood the system with thyreo-iodine out of all proportion to its needs.

Basal Metabolism.

Of the newer modes of differentiating the neurasthenic with tachycardia, with nervousness and with wasting from the hyperthyreoid, the basal metabolism estimation has proved the most helpful. Boothley and Sandiford after exhaustive study have concluded that only adrenal and thyreoid stimulation can appreciably alter the basal metabolic rate.

The basal metabolic rate estimation can give valuable help in estimating the improvement being wrought by medical treatment and as to whether sufficient thyreoid has been removed at operation. One has endeavoured to elicit helpful information as to when to step in and operate at the most favourable period and it does help to point out the intercrisis in symptoms.

Can the basal metabolic rate point out a danger point to one side of which operation is safe and to the other not safe? I do not think it can, although a person with a basal metabolic rate above 50+ is getting into the danger area.

Should surgical intervention be necessary in hyperthyreoidism? Yes! It reduces the time of disablement very considerably and the expense of keeping the patient an invalid for years.

Whilst spontaneous recovery can take place over months and years in some cases, very evident permanent visceral degeneration is most often established and indeed death, often ere the goîtrous patient is worn out from myocardial degeneration and failure.

Whilst operation in exophthalmic goître may not remove the exciting factor, provided that sufficient gland is removed, the hyperfunctioning remnant charged with sufficient iodine produces just sufficient thyroxin to meet the needs of the human economy. By the time this enlarges to normal size the exciting factor seems to have disappeared for the most part or perhaps the thyreoid becomes less excitable.

Dr. F. S. Batchelor (Dunedin) said that the subject had been thoroughly discussed by previous speakers. His impression was that exophthalmic goître was less frequent in New Zealand than formerly. There was an increase in the number of cases of toxic adenoma for which operation was indicated. It was interesting to know the percentage of goîtres that became toxic. Mayo estimated this at 25%, but in New Zealand the percentage was higher. It was a moot question whether every patient with toxic adenoma required operation, especially where the adenomata were small. People with this condition seemed to remain in good health for many years. There was a great deal of cardiac failure of goîtrous origin in New Zealand. Iodine was sold promiscuously by pharmacists and advertised freely in the papers in New Zealand and Dr. Batchelor had seen many people in Dunedin nearly killed with iodine. It was a matter in which the Public Health Department should take action.

Pressure and toxicity were the indications for operation. With atoxic adenoma enucleation was of no use. A resection had to be carried out on both sides because the adenomata were often multiple. It was difficult sometimes to find enough healthy tissue to leave. In Dunedin Hospital ether was used for the simple cases. For all others gas and oxygen were given followed by local anæsthesia. He did not like working solely with local anæsthesia owing to the psychic influence on the patient. Gas and oxygen followed by local anæsthesia seemed to be the ideal.

With regard to the technique Pemberton had told him that the recurrent laryngeal nerve was more often cut from the inner or tracheal side than from the outer. He had adopted this method and had had no trouble. He did not expose the trachea more than necessary owing to the risk of tracheitis. They all knew the value of Lugol's solution, but it was not suitable in every case. Some patients did not react; others were made worse. He had attended two girls who had died; he had not been able to restore their general condition with Lugol's solution sufficiently to render them able to stand the operation.

The two stage operation was desirable in a few cases in which the condition of the patient was poor. The surgeon should make up his mind how much he was going to do before the operation commenced and he should adhere to this. If the other side was touched, dense adhesions were formed and the next stage was very difficult.

Dr. H. Hardwick-Smith (Wellington) wished to make a plea for more correct clinical observation. There was a tendency to accept scientific data obtained from experiments, such as the basal metabolic rate and electrocardiographs as the sole deciding factors in the treatment of exophthalmic goître and toxic adenoma. They should observe correctly the condition of the patient especially before he or she had undergone treatment as to whether an operation was to be undertaken in the near future or at some distant date or not at all. The indiscriminate giving of iodine was not confined to the chemist and quack; they in their own profession were very liable to give iodine broadcast in every case of goître. Lugol's solution which Plummer had introduced, had been of great help before the operation for exophthalmic goître.

He uttered a word of warning, which he found that American observers had also emphasized: the administration of Lugol's solution would so quieten the patient, bring down the metabolic rate and quieten the heart that a sense of security was given to the surgeon. This security might be a false one. One of his patients had a large toxic thyreoid of advanced exophthalmic type; he put her to bed and treated her; she improved so much, her weight increased 6·3 kilograms. Previous to operation under the administration of Lugol's solution and digitalis her pulse became normal. All this was in the period of one month or so. He operated by removing four-fifths of the gland, with perfect confidence of an uninterrupted recovery, but she died in forty-eight hours after a violent storm, her temperature rising to nearly 41° C. (106° F.). If he had been guided by his clinical observation when he first saw her, he would not have operated for some months and would have done only a partial thyreoidectomy at the first operation. The surgeon should always realize that in operation on toxic thyreoid death always lurks at his elbow.

He classified exophthalmic goître in two stages, the early uncomplicated stage and the later mixed stage. The first had very definite symptoms. The patient who had exophthalmos, was as a rule bright and cheerful, excitable and had a tendency to be irritable; was willing to do things and always wishing to be about, easily tired, but though highly strung and nervy, not shaky or depressed. In the latter stages or after prolonged symptoms, the patient became depressed, very easily tired, perspired freely and trembled. These symptoms were, he thought, due to the adrenal gland becoming affected as well as the thyreoid. He held that the prognosis in the earlier cases was better and that the basal metabolic rate was raised higher in the later cases.

There had been some discussion in regard to the anæsthetic to be given at the operation for toxic goître. He always used gas and oxygen with local anæsthesia. It was better than ether administered by the open method, because it was less toxic and the patient recovered more quickly with less sickness and what was of the greatest importance, nourishment could be given in the form of glucose almost up to an hour or two before the operation, because the patient was unconscious of the approach of an operation and nourishment could be given immediately after the operation in the form of drink and glucose and milk foods.

It was, in his opinion, very important to feed these patients because their metabolic rate was greatly increased and they needed food or otherwise acidosis was likely to occur after the operation.

In those doubtful patients during operation when it was felt that it was not wise to proceed to remove the second lobe of the gland, he inserted blanket stitches through the lobe which he left to shut off the blood supply. He had found this satisfactory.

He agreed with Mr. Kilvington that it was wiser to leave a small layer of the posterior portion of the lobes, by that means they could avoid the laryngeal nerves and they would not be liable to remove the parathyreoid tissue. He had not had a case of tetany among a large number of patients over a period of years. He ascribed this to the procedure of leaving the posterior layer of the lobes.

A point that should be borne in mind when operating was to handle the gland very gently, for it seemed that absorption from the gland at the time of operation was the main cause of the storm which followed.

He raised the question of how far the removal of four-fifths of the thyreoid gland would affect patients in the future. He had had several patients who had had large toxic thyreoid glands removed some years previously. They had returned with definite hypothyreoid symptoms bordering on myxœdema.

Mention had been made of transplantation of the gland. Fourteen years before he had transplanted a mother's thyreoid gland into her child's neck, aged one year, who was a typical cretin, not a mongol. He had not seen the child afterwards till it was ten years old; though it had had no thyreoid medication during the interval, there was no sign of cretinish, but the child was dwarfish and old looking with a dryish skin and hair, but intelligent though backward; there were no signs of imbecility. He gave the child thyreoid medication, realizing that the graft was not sufficient for the child. She improved and did moderately well at school, but was backward. At the age of fourteen her periods commenced regularly. Then the mother brought the child to him because she noticed a small lump in the neck. On examination he found that it was the small graft which had taken on physiological growth at puberty.

MR. H. B. DEVINE thought that there could be no routine anæsthetic or method of operating. The surgeon had to visualize the exact pathological condition which was present in the particular patient and adapt the anæsthetic and his methods to that. For example, in the almost "burnt out" exophthalmic goître in an old person with the usual accompaniment, cardiac disease, nitrous oxide-oxygen mixture was not the best kind of anæsthetic. In extremely serious conditions of this kind the patients were amenable to local anæsthesia; the operation should be done under local anæsthesia. The effect of consciousness and fear did not come into the problem. In fact the effect of fear was exaggerated and there was an element of humbug in its management. In other patients who were good "risks," it was possible and advisable to operate under the lightest possible ether anæsthesia; indeed, it was not generally understood how little ether sufficed; it was so little that the effect on the patient was comparable to that of nitrous oxide. The latter anæsthetic he thought should be reserved for the psychologically difficult patient with toxic symptoms. He did not believe in combining any of the anæsthetics with scopolamine or morphine. The patients did not do so well after. If local anæsthesia were used and Lugol's solution given, good results could be expected even when the condition was severe. Another very important principle in the surgical management of toxic goître was the question of operating in stages. Mayo advocated a one-stage operation in which the greater part of both lobes was removed, if Lugol's solution was given before the operation. He had no doubt whatever from his own experience that the Lugol treatment rendered the operation much safer, but he would like to issue a warning not to do the one-stage operation as a routine. The crucial points and *desiderata* in the operation, dexterity, speed, hæmostasis, shortness of operation and therefore minimum of anæsthesia might not be attained by any particular surgeon. He wished to state that careful observation of a large number of goître patients operated on in the Mayo Clinic had revealed that the patients were operated upon much earlier in the course of the disease than they were in Australia. Mr. Devine said that he still used operation in stages in the worst cases.

DR. J. RAMSAY (Launceston) said that his experience went back to the beginning of the century when he performed these operations under local anæsthesia with Theodore Kocher's technique. Less ether was needed when local anæsthesia was employed. He had seen Crile operate four years previously. Delicacy of manipulation affected the after results and local anæsthesia made the surgeon more gentle. He should avoid holding the gland if possible. He always used a knife and not scissors in cutting thyreoid tissue. He always tried to complete the operation in one sitting, but he was guided by the patient's general condition. Lugol's solution had modified their ideas. It was efficient both before and after operation in counteracting toxic symptoms. Lugol's iodine solution might not produce an ameliorating effect in some cases of toxic adenoma. If no benefit followed in two or three days operation should be undertaken.

In regard to X ray treatment two of his patients just after the climacteric had developed myxœdema. The difficulty in respect of recurrent laryngeal nerve arose where a tongue of thyreoid tissue existed behind the trachea.

DR. GORDON CRAIG (Sydney) said that he had listened with much interest to the papers on the surgical aspect of goître. One point he would like to emphasize was that the mortality was greatest in the first forty-eight hours. The severe symptoms and the storm in exophthalmic goître were supposed to be associated with an overdose of thyreoid material. In reality it might be due to a deficiency of this element. When maniacal symptoms occurred there was at times great improvement with intravenous injections of thyroxin. Glucose-saline solution gave the patient fluid

nourishment and comfort. He had had the same anæsthetist for seven years and had used ether administered by the intratracheal method in an increasing percentage of all major cases. He criticized the percentage of deaths that Dr. Kilvington quoted with intratracheal anæsthesia. This was reserved for bad "surgical risks." The death was put down to the anæsthesia and not to the condition. The smooth recovery made him a strong advocate of intratracheal anæsthesia.

DR. A. M. BIGGS (Dunedin) advocated the use of ether administration through the rectum. He recommended daily rectal saline enemata and daily hypodermic injections of saline solution until the day of operation when these were replaced by morphine and scopolamine and rectal injections of ether. Within half an hour the patient was asleep and only required a few drops of ether on the mask. The rectum was washed out as soon as the operation was completed. Rectal injections of saline and glucose solution were given for the next forty-eight hours. The objection that there was no control over the amount of ether absorbed, was theoretical only.

Dr. E. Gordon Anderson asked Dr. Trumble within what limits the basal metabolic rate was normal. He wished to have some idea as to what level was too dangerous for the operation to be performed.

In answer to Dr. Anderson DR. TRUMBLE said that the normal basal metabolic rate was fixed by Benedict at 10% above or below normal. He could not fix the danger line. It had to be decided whether in bad cases the figure would come down or whether it was necessary to prevent the rate rising higher by operating.

Dr. Batchelor had asked how many cases of adenoma became toxic. The question of malignancy was important and for this reason also adenomata should be removed. He agreed that Lugol's solution did not always yield good results. As Dr. Hardwick-Smith had said the basal metabolic rate was a help to clinical methods only especially in border line cases.

In reply to Dr. Ramsay he pointed out that bad results were to be expected if Lugol's solution was used for patients with toxic adenomata.

DR. KILVINGTON said that the speakers had agreed on several points. Nearly all had agreed that the operation for severe goitres should be performed in two stages. There was an uncertain element in the border line cases. It was a question whether to remove the adenoma before the toxic symptoms appeared. It appeared that there was a definite risk in the promiscuous use of iodine as advocated by pharmacists. Preliminary use of iodine might not be advisable in adenoma, but the great difference and really the only important one was in the choice of anæsthetic. He thought that the great advantage of gas and oxygen was that the patient soon regained consciousness and that there was no vomiting.

SECTION III.—OBSTETRICS AND GYNÆCOLOGY.

THE PRESENT POSITION OF OBSTETRICS AND GYNÆCOLOGY.

By J. W. DUNBAR HOOPER, M.D.,
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LADIES AND GENTLEMEN, tonight I hope to draw your attention to a surface view of our present position in obstetrics and gynæcology, without bringing to your notice any selected problems that are more fitted for discussions in special papers.

My first and most pleasing duty is to thank the Council of the Victorian Branch of the British Medical Association for nominating me President of this section and to the committee of this Congress for kindly confirming that suggestion, thus giving me the great honour I hold tonight.

Let us glance for a few minutes at the past. I have strong reasons for believing that forty years ago the practice of obstetrics attained a very much higher position in the profession than it does today. Recalling my student days and those of the earlier years of practice, I am convinced that the general practitioner at that period regarded obstetrics, called in those days "midwifery," as by far the most important branch of his work. Although antiseptics were used, little was known of asepsis nor had the wearing of sterilized rubber gloves come into vogue; but cleanliness was certainly taught and above all, the dangers of "meddlesome midwifery" were impressed on the student and young practitioners on every possible occasion. The blessings of chloroform were well known and it was quite usual that the first and second stages of parturition should be conducted under mild chloroform anæsthesia, though care had to be taken when the illuminant was an open gas jet. Seldom was ether used during any stage of parturition and morphine scopolamine narcosis was unheard of.

The term "antenatal observation" was unknown. I well remember Dr. J. W. Ballantyne, the pioneer in this movement, being treated with scant consideration by his professional brethren. Ultimately he secured one (!) bed for antenatal observation and treatment in the Edinburgh Royal Maternity Hospital (1901). The cases which demanded Cæsarean section, were indeed few and far between and were the subjects of much discussion among the profession, although between 1890 and 1895 Dr. Murdoch Cameron, of Glasgow, published his first series of fifty cases of Cæsarean section without mortality.[1]

Practitioners in those days thought it their duty to remain a few hours longer at the bedside in the hope of effecting a delivery in a difficult case *per vias naturales*. There were times, of course, when abdominal surgery or pubiotomy was really necessary. Nowadays abdominal examinations and pelvic measurements should be made during antenatal observation.

The much dreaded eclampsia was frequently in evidence and I am sorry to say that I believe that *accouchement forcé*, though strongly denounced by the teachers, was frequently carried out in this complication. However, as medical education advanced and especially as the malign influences of pathogenic bacteria were recognized, so the teaching of obstetrics became more and more intensified on aseptic surgical lines.

Obstetric physicians had been appointed to the leading metropolitan hospitals in London and the provinces, but their duties were strictly limited to medical work; they were not allowed to operate, but when the different committees of the various hospitals recognized that many women required operations, they permitted the obstetric departments to have surgeons attached, but the physicians remained in charge. I myself have seen on more than one occasion an obstetric physician of eminence standing

by while his patient was operated upon by one of the surgeons of the hospital.

This position led to much bitterness in the profession and certainly lessened the dignity and status of the obstetric physicians attached to the hospitals. Gradually, however, many men who had devoted themselves to surgery and had attained the highest qualifications, did not think it beneath their dignity to be specially attached to the obstetrical department, where they had the privilege of performing Cæsarean section or any other surgical operation.

Today, in Australia and New Zealand, and indeed in the Old Country also, the practitioners in charge of obstetric departments are recognized as surgeons and perform the necessary operations. But the trend of obstetrics, I am convinced, has advanced to a position where the dangers of "meddlesome midwifery" tend to be lost sight of and the advantages of timely operations are impressed on the students. Consider the Cæsarean sections and you will see by the professional records of the different large maternity departments how many of these operations and the induction of labour before term are being performed each year with lowered mortality; and hand in hand with that are the extraordinarily good results of antenatal care which, one can testify, have practically eliminated 95% of the causes of eclampsia.

It is the exception nowadays to see a general practitioner not wearing sterilized rubber gloves when attending confinements. These rubber gloves were introduced by Dr. Wm. Halstead, of Baltimore, United States of America, in 1896, but I think Dr. Geddes in 1925 is absolutely wrong in writing that the possession of sterilized gloves lessens the necessity for a man to be most careful when trying to sterilize his hands. Dr. Geddes's thesis was reviewed in *The British Medical Journal* and THE MEDICAL JOURNAL OF AUSTRALIA in 1925.

When I was in charge of the Women's Hospital, Melbourne, in 1885 and 1886 and was for many years subsequently on the honorary staff, the average number of confinements was something over one thousand *per annum,* with one and afterwards two resident surgeons who took charge also of the gynæcological service in the same hospital. Now the work at that hospital has increased so enormously that last year there were over two thousand six hundred indoor confinements, with a staff of four honorary obstetric surgeons constantly on duty, who also carry out the antenatal work, and there are in addition a medical superintendent, two obstetric resident surgeons and three resident surgeons for gynæcology, besides a special honorary surgical staff for the gynæcological department. This year the honorary obstetric staff of the Women's Hospital invited an open discussion on their annual report which gave the results of their first attempt to standardize the work. I hope some day to see this and other reports issued from large Australian and New Zealand hospitals as standard works for the guidance of practitioners in Australasia.

You will have during our congress the pros and cons of Cæsarean section and the methods of conducting that operation fully laid before you, but I venture to believe, indeed I am convinced, that the best obstetrician is not he who most frequently performs operations, but one who remembers the dangers of meddlesome obstetrics, the risks of hurry and the extreme value of antenatal work and caution in diagnosis and who has the ability to perform a Cæsarean section or pubiotomy with extremely careful aseptic technique. Surely in this southern hemisphere with our large, unfilled spaces, our mild temperate climate, with abundance of sunshine and a reasonable rainfall, with a good food supply and entire absence of extreme poverty and very happy industrial conditions of living, surely I say, there should be little evidence of pelvic dystocia which demands the Cæsarean operation.

For some years the obstetricians and gynæcologists have not received the proper status which they claim from their professional brethren.

The position of the general practitioner would be raised in the eyes of the public if we, as a profession, dropped the term "midwifery" and used the rightful nomenclature "obstetrics."

In Melbourne and indeed in Australia we have suffered by the official neglect of obstetrics as though the subject could be considered as almost of secondary importance in the medical curriculum. Not so long ago when a lecturer in obstetrics had to be appointed, one university gave less than seven days' notice that the appointment was to be made on a given date. Sydney has been more fortunate in that her lectureship in obstetrics has been advanced to the dignity of a professorship with expert assistants and a teaching staff which do honour to the work.

When one recalls the physical toil, the broken sleep, the weary night drives in the country over very rough roads, the loss of other practice by having to remain beside the one patient and often the loss of the annual holiday because of obstetric engagement, the broken social relaxations; when one considers all these, one cannot suppress a grumble at the attitude of some of our professional men to the hard work of the general practitioner who attends patients in their confinements. It is hard enough for us in a large city with plenty of help at hand to practise obstetrics; we often lose our sleep and cannot be sure of an annual holiday, but it is an infinitely worse position for the zealous and conscientious general practitioner who does such difficult and very often unpleasant work in the bush or suburbs and very often in the night time and without any skilled help.

And yet it is a great deal our own fault if we do not demand from our professional brethren and the public the consideration and status that we earn. I think the fees for attending ordinary confinements in private practice should be higher than at present, having consideration for the amount of antenatal work which is done for each patient and which demands many visits or consultations. I think the public should be educated as to the value of our

work and, while keeping the charitable hospitals for the really poor, I feel convinced that the industrial classes could and would pay a somewhat higher fee for the obstetric services and attention to their wives, in intermediate hospitals or in their own homes, say from seven to ten guineas for first confinements and from five to seven guineas for *multiparæ*, including, of course, antenatal attention and after care. One must remember that intermediate hospitals are extremely convenient both for the patient and the practitioner and also that our Commonwealth Government gives five pounds to the mother, as a maternity bonus, for each child born alive or stillborn after seven months of uterine life.

In the Dominion of New Zealand under the National Provident Fund which has no medical examination on entry, a maternity allowance not exceeding six pounds for medical attention and nursing is payable to the contributor or mother. This maternity allowance is payable only if the combined income of contributors, wife and husband, does not exceed £300 *per annum* at the time of claim; they have to contribute for twelve months before the claim becomes valid. Then by the *National Provident Fund Amendment Act*, 1925, provision is made for retiring allowances to nurses and other members of the permanent staffs of hospital boards. The act imposes on hospital boards the obligation to contribute to the fund on behalf of their permanent officers.

In the New Zealand "Year Book" for 1926, on page 160, you will find set out the death rate per thousand births during the years 1872 to 1924.

The highest was in 1885	7·3
The lowest was in 1913	3·58
The death rate in 1924 was	5·00
The death rate in 1925 was	4·65

Maternity figures for Holland are exceptionally interesting. For the periods 1916 to 1920 the total death rate including sepsis and other causes was 2·6 per thousand births, in 1921 it was 2·28, in 1922 it was 2·44, and in 1923 it was 2·33 per thousand births.

The death rate per thousand births was:

In the United States of America in 1924	6·50
In Canada in 1925	4·70
In Scotland in 1925	6·16
In England and Wales in 1925	4·08
In Australia in 1925	5·64
In England and Wales from 1921 to 1925 inclusive:	
Under the old classification	3·60
Under the new classification, that is, where childbirth is mentioned on the certificate	5·04
In Australia for 1924 was: Out of 134,927 births there were 738 deaths in childbirth	5·47
In Australia for 1925 the deaths in childbirth out of 135,792 births were 766	5·64
In New Zealand for the year 1924	5·00
In New Zealand for the year 1925	4·65
In Victoria in 1885	5·6
In Victoria in 1924	5·48
In Victoria in 1925	4·37
In England and Wales in 1885	4·08
In England and Wales in 1925	5·04

There has been a world-wide movement throughout civilized countries to attempt to diminish these mortality and morbidity rates and each country has sought by its own methods to ascertain where the faults lie. Whereas in England about 60% of the women in their confinement are attended by midwives, in Australia, and especially in Victoria, about 91% are attended by doctors. I am uncertain of the ratio in New Zealand.

The sparsity of our population in Australia demands the very best obstetrics. Yet in the last two years we have lost 1,504 mothers in childbirth out of 270,719 births.

I do not say that the mortality and morbidity in Australia is as high or even higher than other countries, but as in New Zealand we are determined to find out why the mortality is as high as it is and therefore we have the services like this Dominion, as you know, of a director of maternity work. One practitioner who has not a surgical or aseptic conscience, who does what we call "dirty work" with dirty hands, will by his large number of septic cases and deaths seriously affect the statistics of the whole of the State.

I believe that the better the obstetrics, the less need will there be for the gynæcologist. Until recently the honorary positions in obstetrics were held for four years and then promotion was made to what used to be called the senior or gynæcological staff. In my opinion the work of the obstetric surgeon is of far more importance than that of the gynæcologist.

In Victoria we are indeed fortunate that the Edward Wilson (*Argus*) Trust Fund has been good enough to provide the money for a directorship in obstetrical research for two years. The present Director, Dr. Marshall Allan, by his knowledge, tact and energy in meeting every one of the general practitioners in conference, has been able to tackle the different problems of his task.

Our mortality and morbidity in Australasia should be so low as to become the envy of the peoples in the Old Country and Europe. Yet look at the low mortality among the Dutch and Swedes, namely, less than 2·50 per thousand in childbirth from all causes!

Unfortunately, some members of the honorary staff in obstetric hospitals in Australia and I presume in the Old Country also are content to occupy their honorary position for many years, without taking the trouble to attend the confinements, entrusting the entire work to resident surgeons who in most cases hold appointments for six or twelve months at the longest.

Even today I think you will agree that if a country or suburban practitioner has a difficult confinement, he very rarely sends for a specialist, either to town or in his own district, but calls in a personal friend who is a general practitioner, also living in the district and together they tackle the problem. I doubt whether an obstetrician devoting the whole of his time to obstetric work in hospital and private practice would make an income sufficient to keep himself in comfort. Therefore, we in Victoria are

striving to have a professor of obstetrics who would teach the students during the curriculum, and the general practitioner in post-graduate work the latest knowledge gleaned from research in obstetrics and whose services should be available in urgent cases among the public, where the medical man already in attendance could be entitled to ask his opinion.

It is absolutely necessary that the public should be educated to see the need of encouraging such study in obstetrics, in antenatal work and in post-natal work and that the profession should be convinced that consultants in obstetric work could be made available for their service under special circumstances. These consultants should not be permitted to engage in private practice (in obstetrics) on their own account in competition with other medical practitioners, but would hold hospital appointments and see patients only in consultation with doctors who are already in attendance. Such consultants should be subsidized by the government. If practitioners continue to treat their obstetric engagements as so-called "midis" to be carried through as quickly as possible and to use the confinements merely as stepping stones to a large general practice, as long as that is our own opinion of our work, we cannot be surprised if practitioners in the other branches regard our status as beneath their dignity.

As I have said, I think the obstetrician should be better paid and I feel convinced that the general public would realize the improved service and would be willing to pay for it. Practitioners would thus be enabled to attend patients in obstetric work without hurrying cases unnecessarily and they need only take a limited number each year, say one hundred *per annum*. They would thus do better work and would be able to secure that needful rest which comes from an annual holiday and change of environment.

You will pardon me if I speak more definitely of obstetrics in Victoria, because there we have an indoor public maternity service which is probably the largest within the British Empire.

I am convinced by an experience of forty years' continuous work and observation that, except in a few tragic abnormalities such as *placenta prævia*, gross distortion of the pelvis or tuberculosis of the sacrum, a careful practitioner can conduct a large private family practice and personally deliver some 3,060 women within his lifetime with an extremely low mortality and exceedingly low morbidity, but the price of that result is an insistent watchfulness and scrupulous care in technique. My own somewhat limited experience is this. Of these 3,060 cases at least 80% were normal or very slightly abnormal before confinement. Among the complications which required operation were six necessitating Cæsarean section and six requiring pubiotomy. Of the former one patient died, a patient I saw in consultation some miles away from Melbourne. She had been three days in labour; she had a retrodeviated gravid uterus at term, the *os externum* could not be reached and the child was dead. The mother died three days later.

One patient with *placenta prævia* I saw in consultation with her family medical adviser. I delivered her myself *per vias naturales*. Both mother and infant died.

These two were the only maternal deaths of patients delivered by myself. But I lost one infant which died during delivery after pubiotomy and three infants died in breech deliveries. Antenatal observation avoided eclampsia except in four severe cases; the patients all did well subsequently.

It has been pointed out again and again that the apparently healthy woman delivered in the best surroundings may incur a puerperal infection, whereas a poor woman in squalid and unhealthy surroundings comes through without a trace of pyrexia. It is now our business to check immediately that "parrot" cry about the dirty nurse, the untrained nurse and "Gamp" as the causes of our sepsis.

A sign of the times which will surely come to pass in Australasia as it has recently in England, is that where a hospital or institution or body of nurses working together has a high morbidity and mortality, the Government, represented by the Ministry of Health, will step in and close the hospital, dismiss the superintendent and certain nurses and some of the staff and make a clean sweep of the whole service in that area. Note what has occurred quite recently in a place called Kingston, England, as shown in *The British Medical Journal*.[2]

Finally, I think the most important events in the last decade in obstetric research may be enumerated as follows:

1. The great improvement in ante-natal observation.
2. The habitual use of sterile rubber gloves.
3. The striving for surgical asepsis.
4. The ability to convert occipito-posterior positions and the invention of Kielland's forceps for use in persistent occipito-posterior positions.
5. The use of the extract of the posterior lobe of the pituitary gland.
6. The unremitting search for the causal agents of puerperal sepsis, the streptococcus and *Staphylococcus aureus*, which organisms will be found in nearly all cases to have started in some focal infection, such as pyorrhœa or in the bowel (*Bacillus coli communis*) or in other cases may be traced through the nipple.

I am more than ever convinced that the presence of streptococci in the blood in parturient women has its origin in some dental caries or pyorrhœa. I do not think that this theory has been absolutely proved up to the present, but research is being done on this suggestion and if it be proved to be correct, very great light will be thrown on the origin of cases of septicæmia which are at present unexplainable.

In Australia obstetric work is being standardized and I presume that you in this Dominion have something of the same kind of work being done under the guidance of Dr. Henry Jellett, a man of vast

and exceptional experience in obstetrics and a teacher of European fame before ever he touched your shores.

The Inland Mission of the Presbyterian Church of Australia sends medical and nursing succour to women in the bush, even sending medical aid and transporting a nurse or doctor or both by aeroplane over long distances, even four hundred and five hundred miles in the north of New South Wales, Queensland and the Northern Territory; already some of our younger professional brethren have taken up flying duties with this service.

This is only part of the strong movement for strengthening the maternity service throughout the Empire. We in these Dominions are doing our share in this national service to reduce maternal mortality and morbidity. Practitioners are now reporting more accurately their cases of mortality when due to childbirth. Therefore, the statistics will show an apparent increase in the death rate. But within a very few years I am convinced that our statistics will prove that the science of obstetrics, practised with caution and with clean hands, will prove that our energy and research have resulted in a greatly diminished mortality and morbidity. To save the women, not only from death in childbirth, but to make them healthier for their daily work, is our task and our duty.

Ladies and gentlemen, one's life work may be made up of trifles in order to ensure perfection, but, as that great painter, Michael Angelo, said: "Perfection is made up of trifles, yet perfection itself is no trifle."

The Present Position of Gynæcology.

Let us glance back! We find that gynæcology became a specialty about 1870 to 1880, because such powerful personalities as Lawson Tait and Spencer Wells in England determined to obtain recognition for gynæcology from the rest of the profession. Yet in 1890 to obtain a special department for gynæcology in the general hospitals was a very difficult proposition and very much opposed by the leading men of the profession at that date. I can well remember when men who had succeeded in getting appointments to the surgical staffs of the general hospitals, endeavoured to keep the gynæcologist off the staff. Lawson Tait replied to this manœuvre by starting a women's hospital of his own in Birmingham (1871); and yet to this day when gynæcologists are appointed to nearly all the first-class teaching hospitals throughout the southern hemisphere, it is no uncommon thing for patients with gynæcological affections to be admitted and operated upon by general surgeons, even though there be skilled gynæcologists on the staff. The general surgeon of today certainly regards gynæcological surgery as part and parcel of his domain and of course with the high training in general surgery today, undoubtedly much excellent surgery is done. But gynæcology is not all surgery, so who is to practise gynæcological medicine and radiotherapy unless the gynæcologist, assisted by the radiologist, fills the entire field of this branch. What likelihood has he to obtain a competency or a comfortable livelihood, if the necessary surgery is divided between himself and the general surgeon? Unquestionably a few general surgeons do scrupulously avoid gynæcology, but the bulk of them do not hesitate to undertake gynæcological operations. It is rare indeed, however, to find the converse. No honourable gynæcologist would tackle the surgery, say, of fractures or of head injuries or injuries to joints, for in the diagnosis and treatment of these conditions he has not had the special training.

Opportunities should be given, however, in post-graduate work for gynæcologists to restudy the surgical anatomy of the female pelvis and the abdominal viscera, the physiology of the ductless glands and renal efficiency and these subjects, I hope, will be taken up by the various post-graduate committees. Because gynæcology demands the study of the endocrines, there is a large scope for the medical gynæcologist.

Remembering what was the state of gynæcology forty years ago, I shall shortly put before you the present position.

Firstly, the successful gynæcologist must be a strong believer in asepsis with all its necessary technique; he must wear sterilized rubber gloves; he must know when to use the Trendelenburg position and when to discard it, when to use the Fowler position and when to discard it; and he must study renal efficiency. He must know how to sterilize the skin thoroughly and yet not to raise dermatitis or blisters. He must always avoid chloroform in septic cases and very often in many others and must know the dangers of open ether and ether *plus* oxygen; whether the patient should have a preliminary injection of morphine and atropine combined or alone is a matter still for discussion. In nearly all cases primary healing takes place after the operation. Whereas we used to starve our patients and to use the drainage tube after operations, we now try to bring them to the operating table in as good a condition as possible and the glass or rubber drainage tube is rarely used during the after treatment. The operating table should be warmed to blood heat, not higher and the room to 19° C. (66° F.) and the apparatus should be ready for proctoclysis and intravenous transfusion. One of the greatest advantages of gynæcology in recent years is the proper use of Rubin's apparatus for determining the permeability of the Fallopian tubes. Personally, in the after treatment of abdominal operations I give great attention to the efficient functioning of the bowels and kidneys and before any abdominal operation and indeed before all parturitions I try to make sure that the teeth and gums are as sound as the care of a competent dentist can make them. Today the gynæcologist frequently calls in the aid of the skiagraphist and the use of radium or deep X ray therapy.

While I emphasize the great need for more gynæcological beds in large hospitals, I still urgently say that the greater need is that women

could be permitted to have rest and local treatment so as to avoid, if possible, the need for gynæcological operations.

Therefore, it comes to this, that a general hospital with a moderate demand for gynæcological cases should have a ward of twelve beds, six for observation and local treatment and the other six for surgery, major or minor, and I think that two or three small wards should be set apart for the more serious abdominal cases.

It is a trite saying that the better the obstetrics, the less need for the gynæcologist; while one admires the pugnacity of the early gynæcologists who strove for recognition in their special subject, yet one must remember that some of them did great harm to their special department by overzeal for operating.

To show you how great the need is for such beds I have only to tell you that out of three thousand beds set apart in teaching hospitals in Australia and New Zealand, only one hundred and ninety-eight beds are reserved for gynæcology. How is it possible with that small number of beds for the gynæcologists to treat the large waiting list without operations which are demanded by the women as speedy methods of cure, rather than to remain six to eight weeks in bed with rest and local treatment? One must admit that some of the patients who cannot be taken into the gynæcological clinic, have to go to the general surgeon.

The outstanding features in the improvement in gynæcological practice are given below:

1. The perfection of aseptic technique.
2. The use of the transplantation of ovaries.
3. The well-balanced appreciation of the functions of the endocrine glands and of the use of radium and radiotherapy.
4. The application of Rubin's apparatus for diagnostic purposes.
5. The great success of certain methods of treating streptococcal infections, which will be demonstrated to you during the Congress.

References.

(a) Murdoch Cameron: "Remarks on Fifty Cases of Cæsarean Section," *The British Medical Journal*, October 11, 1902, page 1126.
(b) *The British Medical Journal*, June 19, 1926, page 1069; July 3, 1926, page 40; July 10, 1926, page 101.

DR. A. NORMAN MCARTHUR (Melbourne) said that he wished to thank the President for his excellent address and to show his appreciation of the extremely valuable advice given.

DR. F. R. RILEY (Dunedin) was glad that the President had drawn attention to the fact that there was not sufficient importance given to the subject of obstetrics. In New Zealand the nurses during their training often attended more women in labour than the students in their course. A young practitioner's career depended on his knowledge of obstetrics; the general practitioner could not afford to make mistakes. He thanked the President for his instructive address.

DR. H. JELLETT (Christchurch) thanked the President for his most instructive address and hoped that it would be assimilated. He wished to emphasize two points, the necessity for conservative obstetrics and the teaching of obstetrics to students. Dr. Riley, he considered, should be made a professor and should be given more material and more scope for the teaching of this most important subject.

PROFESSOR J. C. WINDEYER (Sydney) also wished to convey his thanks to the President. He desired to see the practice begun in Victoria by Dr. Hooper of the standardization of all hospitals continued throughout Australia.

DR. DUNBAR HOOPER replied briefly.

SOME OBSERVATIONS ON RUBIN'S TRANSUTERINE INSUFFLATION OF THE FALLOPIAN TUBES:

A Study of One Hundred and Forty Cases.

By C. F. MORKANE, M.B., Ch.B. (New Zealand), F.R.C.S.E.,
Christchurch, New Zealand.

To give an intelligent prognosis and treatment of sterility one must know whether the Fallopian tubes are patent or not.

The test to demonstrate this patency or occlusion is universally known as the Rubin test, after Dr. I. C. Rubin, of New York.

I began using the test towards the end of 1922 and have used it mainly for diagnostic purposes in one hundred and forty cases of sterility. Over one hundred of the patients have been tested during the last two years, that is, since I visited Dr. Rubin and saw him at work in his consulting rooms. Apart from these sterility cases, I have used the test for diagnostic purposes in other pelvic conditions.

In every case Rubin employs a mercurial manometer, the fluoroscope and carbonic acid gas. The apparatus I have adopted is simple and has proved satisfactory. It consists of uterine cannula, glass T-piece, rubber tubing, rubber bag and a Tyco's manometer. The cannula is so shaped at the end inserted as to fit the curve of the cervical canal and in addition to the perforation at the tip is fenestrated at the sides near the tip. A tube that is not fenestrated in this way, may lead to errors. On the cannula is fitted a rubber acorn or urethral tip and this fits securely into the lumen of the external *os* and so prevents regurgitation of air through the cervix. The cannula is connected by tubing to one end of the glass T, another end of the T leads to the manometer and the third end is joined to the rubber bag which has a capacity of about one hundred and twenty cubic centimetres (four fluid ounces).

In application of the test the patient is placed in the lithotomy position. A bivalve is inserted, iodine is applied to the cervix and the cannula is inserted. In order to steady the cervix, it is helpful to use volsella to grasp the mucous membrane in front of the cervix. A careful pelvic examination must precede the test and the position of the uterus also must be made out so as to direct the cannula in the course of the uterine canal.

Before actual use the apparatus is tested in order to make sure that there is no leakage and to blow out any water that may be in the cannula. If there is much mucus at the cervix, it is aspirated by means of the suction apparatus. On a few occasions before inserting the cannula a sound was passed to

determine the direction of the canal or to measure its length. In most cases the rate at which the air is forced out of the bulb, showed that the tubes were patent at seventy to eighty millimetres pressure. In a number of cases the pressure went to about one hundred and twenty millimetres and then fell quite suddenly to seventy millimetres or a little more. It was not very uncommon for the pressure not to exceed forty millimetres. If no air passes through at two hundred millimetres pressure, another trial is given. Should this second trial at the above pressure not prove successful, the patient is asked to return later for another test. In choosing the most favourable time for the application of the test, I have followed Rubin's recommendation, namely, the fourth to the seventh day after menstruation. The patient is requested to abstain from coitus in the meantime. In such favourable times and circumstances, the test will occasionally show patency in cases that at the first test seemed to indicate occlusion. It is not advisable to apply the test before the menstrual period, for not only is the endometrium then less favourable for the test, but we must consider the possibility of the existence of an early pregnancy. If the second test still shows occlusion, a confirmatory test in four-months' time is advised and if no air passes through at two hundred millimetres, the condition is put down as one of occluded tubes. However, all the patients in whom the signs of occlusion were present at the second visit and who were tested yet a third time, were found to have occluded tubes at the final test. If air passes through only at a pressure as great as one hundred and thirty or one hundred and forty millimetres and the test causes pain in one or both sides of lower part of the abdomen, the case is judged to be one of partial obstruction with tubal trouble on one or both sides according to the position of the pain. If the pain is central and no air passes through, the case is deemed to be one of occlusion at the uterine ends. If there is pain on one side or on both sides and no air passes through, we may judge there is probable occlusion at the fimbriated end. If the tubes are patent (and under the heading of patency I have included the cases of partial obstruction, when the patient gets up from the table, the air rises and lodges under the diaphragm and causes pain in the shoulder region, usually the right. I rely on the manometer reading and the pain in the shoulder as proof that the tubes are patent. When the air passes, but there is an absence of the shoulder pain, I repeat the test as a confirmatory measure. Rubin confirms the evidence of the manometer reading and shoulder pain with the fluoroscope, which, in cases of patency, shows a well marked layer between the diaphragm and the liver. If the tubes are patent, the patient usually has some discomfort or "feels queer," but once she is assured that the pain is due to the test and will pass off quickly, the relief is considerable. Although air is not absorbed as rapidly as carbonic acid gas, the pain as a rule is not of long duration. On one occasion, however, the pain persisted for about forty hours. The genu-pectoral position will hasten the disappearance of the pain. The amount of pain appears to depend on the patient more than on the amount of air inserted.

To locate the obstruction, I have relied on the location of the pain and on the pressure and in all patients who were subject to abdominal section the diagnosis was confirmed. If the test showed obstruction at the uterine end, I advised against surgical treatment. Consequently, I have no experience of the transplantation operation and I believe that its results must be even worse than those following salpingostomy. Some confirm their judgement of the location of the obstruction by means of a skiagram after potassium iodide or bromide, "Lipiodol" or "Iodipin" has been introduced.

I do not know why the manometer should suddenly drop from, say, one hundred and twenty millimetres to about seventy millimetres, but such a fall is not uncommon. It may be due to the removal of some obstruction, but I am more inclined to the belief that it is due to a sudden relaxation following a spasm of the uterus and the tubes, this relaxation releasing pressure on the uterine portion of the tube. However, in each of the patients to whom I applied the second test, there was no initial rise, the air going through at low pressure from the beginning.

As in some patients in whom occlusion was noted at the first test, the tubes were patent at the second test, it is evident that one should not give a definite opinion as to occlusion on one test only.

On one occasion, in a stout patient who had three tests all showing occlusion, the third test being applied twelve months after the second, I opened the abdomen to do a salpingostomy. This was done two days after the third test and each tube contained small hydrosalpynx, with the fluid slightly stained with fresh blood. In this case I had used two hundred and sixty millimetres pressure as I had been in the habit of doing in similar cases and I then formed the opinion that the pressure used had caused slight bleeding. If that pressure caused the slight bleeding, it might be possible for it in some cases to lead to adhesions. Ever since I have not exceeded a pressure of two hundred millimetres.

In some cases of acute retroflexion of the uterus a greater amount of pressure was necessary to force the air through. In one case of acute retroflexion, in which the air would pass only at one hundred and forty millimetres pressure, the patient subsequently underwent surgical treatment which included shortening the round ligaments. The tubes were satisfactory and a later test showed absolute patency at a pressure of sixty millimetres.

In only one patient out of the one hundred and forty was an anæsthetic necessary to insert the cannula; in the others it passed with little or no discomfort. This would seem to render questionable the necessity of doing a dilatation of the cervix to allow a spermatozoon to pass through.

If ordinary precautions are taken, the danger attaching to the test must be slight. All the patients with sterility, except the one examined under

an anæsthetic, were tested in my consulting rooms. Except with one patient there was no trouble beyond the shoulder pains and perhaps abdominal pain of short duration. This patient became moderately collapsed, but in her case the collapse was not due to the pressure of air on the diaphragm. Very little air had been used on account of severe pain in the right side, the pain beginning very early. Her history showed that she had similar trouble occasionally and that there was the same kind of pain during menstruation. I might point out here that the introduction of an excessive quantity of air may lead to collapse of the patient through pressure of this air on the diaphragm. Pain in the side, if the pain is severe, is always an indication to stop the test.

Contraindications.

A slight cervicitis is not a contraindication. Should there be a mucus plug, it is removed by means of suction apparatus. If the cervicitis is more than very slight, I treat it with the electric cautery and when there is sufficient improvement, the test is applied. Purulent or blood-stained discharges are a definite contraindication, as is pelvic inflammation of recent origin.

A careful pelvic examination must be made to eliminate an existing infection. I cannot trace any infection as a result of the test.

Knowledge of the condition of the tubes is necessary before any cervical operation for sterility is undertaken. In some cases slight pathological changes in the tubes, sufficient to cause occlusion, may be practically impossible of detection without the aid of the Rubin test.

In a large number of patients with occlusion the history proved of considerable interest. Some of these patients had been treated with gland preparations, others had undergone dilatation or curettage or both, while others again had undergone cervical operations (posterior division or repair) or abdominal operations for the relief of sterility.

Thirty-seven of the one hundred and forty patients, that is 26.4%, had occluded tubes. Eighty-six were found to have primary sterility and in twenty-seven, that is 31.4%, occlusion was present. Among fifty four women with relative sterility only ten, or 18.5%, had signs of occlusion. This is a much lower percentage than that usually found in relative sterility. In this series is included a number of patients who were sterile only with their second husbands.

In the primary series the oldest patient was forty-two years of age and the youngest twenty-one; the average age was thirty-one years eight months. In the relative series the oldest was forty-three and the youngest twenty-three; the average age was thirty-three years three months.

The average duration of marriage in the primary class was four years eleven and a half months. The average duration of the sterility in the relative class was five years four months.

Twenty-two, that is 59.7%, of the thirty-seven patients with occluded tubes gave a history of previous surgical treatment for sterility. As the percentage of occluded tubes is so much higher in those giving a history of operations for sterility than in women who have not been treated in this way, it might appear that at times occlusion may be the result of the operation. In any case, it is safe to say a number of useless operations would have been avoided if the Rubin test had been employed.

Although I have used the test mainly for diagnostic purposes, the impression made is that possibly it has therapeutic properties.

It would be useless for obvious reasons to try to give the number of pregnancies that have followed the test or to attribute any pregnancy to the test. However, four patients of whom I have knowledge, became pregnant before the next menstrual period was due. One of these had been primarily sterile for seven years; the other three had relative sterility, one of whom had been sterile for six years.

In addition to the use of the test in these one hundred and forty women suffering from sterility, I have used the test also as an aid to diagnosis in other pelvic conditions, for example, to determine if the tubes were patent after the performance of salpingostomy. The results of the operation were disappointing. I have used the Rubin apparatus soon after having done a salpingostomy with the hope that the tubes might be kept open. Twelve of the thirty-seven patients with occluded tubes were subsequently submitted to abdominal operation. Salpingostomy was performed in eight. Six of the eight women who had salpingostomy performed, were tested later; in two there was occlusion, in two there was partial obstruction (one of these latter manifested the signs of occlusion) and in two the tubes were found to be patent. In one of these two patients, however, some months later partial obstruction developed.

Besides using the apparatus after conservative operations on the tubes, I have employed it in the following cases:

1. After operation for ectopic gestation, to determine if the other tube was patent.

2. After myomectomy to decide if the uterine ostium was intact. In one of these patients there was excessive mutilation of the uterus during the removal of nine subperitoneal and intramural fibroids and interference with the lumen of the tubes appeared to be likely; the test showed patency. This patient has since been delivered of a baby without the assistance of forceps.

3. To determine whether enucleation or hysterectomy was indicated for myoma.

4. In a patient with myoma and patent tubes when no operation was performed as pregnancy was possible.

5. To know the condition of the tubes after operation for appendicitis in which a drainage tube was used.

6. In two patients who were contemplating second marriage and who wished to know if they could become pregnant, as each was sterile with her first husband.

7. In case of one patient whose history showed she had her tubes operated on to prevent pregnancy.

8. Instead of using a fine probe or strand of silkworm gut to test the tubes during operation.

9. As an aid in the differential diagnosis of lower abdominal pain, where no definite lesion was bimanually demonstrable.

Of the other uses of the Rubin test I have no experience. This test should in my opinion be more often employed for diagnostic purposes than is the case at present in this country. Although the test apparently involves little risk, it should not be used indiscriminately; that is it should not be employed without a careful pelvic examination.

In conclusion, I may be allowed to add that my experience in the use of this test has made me fully appreciate the great advance in gynæcology that has resulted from Rubin's work.

DR. W. ANDERSON (Queenstown) said he had watched Dr. Victor Bonney using Rubin's test. He never employed a pressure above 140 millimetres. If the tubes were occluded, he opened the abdomen and frequently found them inflated with air. At the thinnest spot the tube was incised, air was allowed to escape and the hæmorrhage was arrested. Salpingostomy was then performed. He remarked that pregnancy often followed this treatment.

DR. HENRY JELLETT (Christchurch) described the original apparatus used by Rubin, which comprised a "Sparklet" syphon. He agreed that salpingostomy was a deceptive operation. Hydrosalpinx in his opinion was the only condition for which this operation was justifiable. In these patients a large sized ostium was present; all raw peritoneal areas should be completely sewn over.

Long, congested, flabby tubes were the type in which evidence of partial blockage was obtained. These tubes were liable to kink. Before applying Rubin's test, a careful pelvic examination should be made.

DR. A. NORMAN MCARTHUR (Melbourne) quoted cases in which double ectopic gestation had followed salpingostomy operations. He advocated an extensive salpingostomy; the spot where the tube was considered to be normal and healthy was localized; after excision of the diseased portion of the tube, careful eversion of the mucous membrane was carried out. After salpingostomy he always used Rubin's test to discover if the tubes were still patent. He considered that the test was a very valuable aid in diagnosis.

DR. F. R. RILEY (Dunedin) said that Dr. Morkane's apparatus was an extremely simple one and easy to use. The test was one of great diagnostic value. He had performed salpingostomy on very many occasions, but had heard of pregnancy following the operation only in a few instances. He quoted one case in which the woman had to have two operations for ectopic gestation after salpingostomy. Before operating the surgeon should inform the patient of the doubtful result and leave the decision to her.

DR. A. HALFORD (Brisbane) said that Rubin's test had done away with all the old operations for sterility, such as dilating and curetting and plastic cervical operations. He used a short glass tube with a rubber buffer instead of a long tube. He rarely used a pressure more than 140 millimetres. The vagina and cervix should be most carefully sterilized before the test was applied.

DR. MORKANE said that he advised against operation only when the occlusion was at the uterine end of the tube. He had no experience of transplantation of tubes, but he had performed salpingostomy a number of times. He considered the 140 millimetres pressure useless; a much higher pressure was often required. A definite opinion of non-patency should not be given on the result of one test only. The negative result might be one due to spasm; the result of the next test might indicate patency of the tubes. He did not perform cervical operations. He agreed that the vagina and cervix should be thoroughly sterilized. If there was much bleeding, while the cannula was being passed, he abandoned the test for the time being. The test should be performed after the menstrual period. There was always the question of an early pregnancy, if performed before the period.

SECTION V.—PREVENTIVE MEDICINE AND TROPICAL HYGIENE.

HEALTH NURSING: THE SCHOOL NURSE AND COMMUNITY POINT OF VIEW.

By HARVEY SUTTON, M.D., D.P.H.,
Principal Medical Officer, Education Department, New South Wales.

IN New South Wales and Victoria the school nurse is essentially a home visitor or health visitor whose duty is to "follow up" children found defective at the school medical examination. A personal link is thus established between the school medical service and the home. The parent, usually the mother, is interviewed, difficulties explained, treatment pressed and, if necessary, parties of children taken to hospital. Glasses, splints and so forth are supplied to destitute children. The metropolitan area representing 150,000 public school children is divided into six districts and one nurse is usually allotted with one school medical officer to each district. Her efforts practically double the amount of treatment which results from the official notification by letter of defects recorded at medical inspection, thus greatly amplifying the practical value of the doctor's findings. This means true economy by avoiding wastage of the doctor's efforts through carelessness, ignorance or neglect on the part of the parents. Generally speaking, about 40% of parents take action within three months of notification; of those who have not responded after that time, the nurse gets effective results in about 30% to 60%, so that the total treatment is raised to 60% to 80%.

Apart from home visiting certain other duties may be carried out by the nurse.

1. Since 1925 the school nurse visits the school just before the school medical officer's visit, sees that everything is working smoothly and satisfactorily and tests with the Snellen vision chart the children in the third class. She may also refer any child with signs suspicious of disease or defect to the medical officer. No official notice is sent to parents till the medical officer confirms these findings.

2. During these class tests and also independently when entire schools have been investigated, "clean surveys" are undertaken by the nurse. Pediculosis is particularly sought for, nits "dead or alive" being notified to child and parents. Impetigo, ringworm, care of skin, hair, teeth, clothing and the like, ear discharge and similar conditions are all observed and many homes also inspected and reported on by the nurse. Children notified are later reinspected.

The effect on pediculosis is remarkable and the complete eradication of this infestation appears possible.

3. This practical acquaintance with the home makes nurses adequate social investigators and they have reported on such questions as milk consumption and malnutrition and venereal cases in children.

4. To facilitate staff arrangements and to provide for illness of a dental assistant a nurse appointed to a school nurse position is liable to be sent out as a dental assistant to a travelling dental clinic which works in country districts. This is rarely necessary and is purely an accidental happening.

Besides this regular work special duties have on occasion been performed by them. They have acted (i) as assistants in Hookworm Campaign, both in the laboratory and in field work, (ii) in carrying out swabbing in diphtheria, (iii) as assistants in Schick testing, antityphoid and paratyphoid inoculation, vaccination, influenza epidemic, (iv) as assistants to school medical officer in special lectures to high school girls on infant care and home nursing.

With the exception of certain of these special duties the school nurse does her home visiting independently of the school medical officer and directly in touch with the head office. Close cooperation with school medical officer and teacher, however, is practised in the school visits and in district work.

Another special combination of duties is found in the case of the bush nurse who also undertakes school work, carrying out a yearly test of the children. She notes visual defect, malnutrition, skin and hair troubles, eye and ear discharge and so forth. These are notified from the head office and the nurse does the home visiting and also gives a course of about twelve practical demonstrations in personal hygiene, first aid and home nursing in the central and sometimes in other schools of her area. This serves to introduce the nurse into most homes in her area and does not limit her contact to the homes of those who call her in for sickness or midwifery attention.

Training of School Nurse.

No definite training has been insisted on, though the returned army nursing sister receives preference. Several of the nurses, however, have done the work for the certificate of Royal Sanitary Institute or have acted as tuberculosis visitors. What has been sought for have been the less tangible but most important qualities of personality, tact, intelligence and experience in handling parents and children. Any person with these qualities can be an efficient home visitor. The trained nurse has, however, been insisted on partly because her status in the community is of value and partly because her nursing knowledge gives her a background of experience of very great help when discussing with parents the ailments and defects of children and their treatment. She knows, too, "the ropes" at the hospitals, thus saving time and aiding efficiency.

The school nurse thus fills a very important, if narrow, niche in the Temple of Hygiene.

Speaking from an administrative point of view it does not, however, as a position lead anywhere. Added experience and knowledge do not help the nurse to more than a limited promotion and the scope of the work is similar for both seniors and juniors.

The duties of the school nurse and the development of her work are dependent on the number of nurses available and, in the final issue, on finance. A school medical officer as far as medical examination and other routine duties are concerned can control a school population of about 25,000 (effective enrolment); this corresponds to seven or eight thousand examinations a year. This, however, leaves little opportunity for control of infectious disease. By limitation to 20,000 a considerable degree of control could be obtained over epidemics.

To carry out the effective home visiting for the school medical officer we may calculate that every eight thousand examined means three thousand or so children notified for medical defects and about eighteen hundred untreated representing, as these are chiefly infants, say sixteen hundred homes. This is the work of two nurses when other duties mentioned are to be considered and is distributed over about twenty-five schools. To provide a closer control for infectious disease at least one additional nurse per doctor would be necessary. Nurses would then deal with about eight schools each and eight thousand children. Infectious disease varies greatly in extent. Each district usually represents about five thousand homes of which probably one thousand or so have some infectious disease every year. The cost would be for eighteen nurses at £250 a year, £4,500 for a population of 150,000.

If, as is the most important item of all and essential if school epidemics are to be controlled, the children from two to five are to be included, four nurses per district would be required or twenty-four nurses at a cost of £6,000 a year for a population of 200,000 children from two to thirteen inclusive. The school nurse is for preference the person to solve this problem of infectious disease.

It has already been demonstrated that the focus of the infectious diseases is in the pre-school period and that while the school reinforces the spread in the family and from family to family, the main spread is by means of the young children from two to five years of age. Hence the independent school control is stultified by the failure to deal with the pre-school children.

It has also been shown that most, if not all, the throat and nose defects which prove such a nuisance in school life, are already present at school entrance and may be considered the sequels of infectious diseases at the pre-school period. Further, a considerable amount of evidence incriminates children with adenoids or unhealthy tonsils as chronic carriers of these nose and throat infections.

Apart from the health point of view we find *Kindergartens* and in England day nurseries

extending their control over this period. The onus lies on the Education Department or on Health Departments through the Education Department to obtain the health control over its future entrants.

The other possible agency is the infant health nurse. To her the care of children under one year of age and possibly under two should be committed. Generally speaking the less the infant health nurse has to do with infection the better, owing to possibilities of carrying or at least of being accused of carrying infection to very young children in whom infective diseases may be so fatal.

The school nurse would visit every home which contained school children, where any infection had occurred, whether in a school child or not, and also any home not containing any school child at which her aid is sought. She would supervise the arrangements for isolation in the home or removal to hospital and recommend and arrange for prophylactic measures for the contracts; swabbing, Schick testing, prophylactic use of antitoxin, Schick immunization, Dick testing and perhaps immunization, the prophylactic use of vaccines for contacts in whooping cough and so on. This supervision would also facilitate effective treatment, thorough convalescence, proper tests for freedom from infection and return to school.

It will be seen that the control of epidemics has a direct and indirect relationship to school attendances. The very complete knowledge of children of pre-school age as well as of school age in her district would render the school nurse a very effective attendance officer. It would further give us knowledge, not yet possessed, of defectives not attending school, such as mental defectives, cripples, blind, deaf, dumb, epileptic and tuberculous children.

The most important immediate step towards the realization of this somewhat ideal programme is the training of the personnel. The services from which the school nurse is recruited, and her special training for public health work must be reviewed. The nurse's training should be considered in its pre-hospital as well as post-hospital stages.

Before certification the nurse should have experience in home visiting; to provide this would mean an extension of the scope of hospitals in a much desired way. Auxiliary nursing work should be developed under hospital control for all children's and general hospitals. District work is part of the normal programme of obstetric hospitals. The home control of babies with gastro-intestinal affections has been employed with success, by means of trained nurses. District nurses do much of this work also. Every hospital should establish a trained nursing nexus with the home. In-patients could be sent home earlier to convalesce under nursing supervision, but particularly is it desirable for out-patients. Nursing should be brought to the homes of the people. Mothers would be taught to carry out simple nursing treatment at home and would thus save an immense amount of time spent in out-patient waiting rooms. This is especially valuable in those infectious diseases such as measles and whooping cough, not at present catered for at hospital, whether general or infectious. There is nothing new or impracticable in this work; what is needed is its systematization, so that it is part of the training of every nurse. Seeing that so much of their work in the future is in homes, it should be an essential part of their training. It is economically sound, as it would reduce the stress on accommodation and building costs and maintenance of our hospitals, as well as save wasting the time of the medical staff on so much trivial work, save the time of mothers in hospital attendance, avoid the risk to children from transport to hospital and meeting infectious patients at hospital and if carried out by hospital authorities it would escape the objection of intruding in any way on paid medical private practice.

If possible a period of three months at an infectious disease ward or hospital should also be an essential part of training.

After certification the need is for a proper scheme of training for intending applicants (trained nurses) for public health positions. It is inevitable that crowded populations will always be best served by specialists, so that specialist nurses in spite of the overlapping of work will by their sheer efficiency continue to carry out public health work in its various aspects. The chief specialist aspects are infant health, school health, industrial health, tuberculosis. Closely allied are midwifery nurses, bush nurses, mental hygiene and medical social nurses.

At present the routine certificate is that of the Royal Sanitary Institute. This course contains a large amount of sanitary construction and engineering, sanitary law, meat inspection and environmental details which, necessary as they are to the man health inspector, are only of minor importance to the woman health visitor or public health nurse.

While they should be acquainted with fundamental principles of general hygiene and a good deal of practical detail inside the home, they must specialize on the human factor in the creation of health and the prevention of disease, infant care and management, child welfare, infectious diseases, tuberculosis, industrial hygiene. A definite course for health visitors in the Dominions of Australia and New Zealand should be outlined and a definite certificate given.

If a proper supply of nurses is to be assured, the various departments concerned should appoint "cadet" nurses. Applicants of suitable type would be appointed and half time given and fees paid for the course, the applicant signing a bond to serve for two or three years after completing the training period, during which they would undergo the infant health training and obtain the health visitor certificate. The fees and time involved in the courses essential deter many excellent nurses from taking up the training.

A real need exists in every community, especially in every industrial community and especially too amongst the mothers of that community for some person of sound experience and knowledge who can

solve the ever recurring difficulties that arise in connexion with sickness, especially in children, where to go for treatment, how to arrange for convalescence, what body can give advice or more material assistance. Every city has a network of departmental authorities and private societies who may greatly aid the family in difficulties. Some person, above all a human being who is not merely an official, is needed who can act as general inquiry agent, liaison officer, almoner, administrator and general factotum all rolled into one, and who can coordinate all these agencies; this is the community nurse. She would succeed where charity organization societies fail; much overlapping of effort would be avoided and efficiency attained: the greatest good to the greatest number. No existing individual fills the gap. She would be in touch with city health departments and municipal health inspectors, with tuberculosis visitors, with infant health centres, with school nurses, school and attendance officers, child welfare departments, district nursing, hospitals and dispensaries and a multitude of private societies and agencies.

THE PUBLIC HEALTH NURSE IN RELATIONSHIP TO ADMINISTRATIVE PREVENTIVE MEDICINE.

By M. H. WATT, M.D., D.P.H.,
Deputy Director-General, Department of Health, New Zealand.

AT the beginning of the present century and for some years thereafter the scope of public health was limited almost entirely to external sanitation. A department of public health which devoted its energies to the provision of pure water, proper drainage, good housing, wholesome food and an unpolluted atmosphere and to the suppression of infectious diseases by the elementary procedures of notification, isolation and disinfection was regarded as functioning adequately and on sound lines. Today these same matters are still the direct concern of the sanitarian, but public health has become definitely personal in its application and shows a strong and ever-growing tendency to focus its attention on the individual rather than on his environment. As the direct result of this tendency a more or less continuous series of schemes has appeared in recent years dealing with such matters as antenatal care, maternity and infant welfare, child hygiene (both preschool and school age), industrial hygiene and so forth. Infectious disease control also has become much more personal and procedures such as swabbing and inoculation are in every day use for diagnostic or prophylactic purposes. The limited and circumscribed subject of public health in other words has become the broader and more important one of preventive medicine.

In the old days of external sanitation the sanitary inspector was the logical and very often the sole assistant of the medical officer of health. He discharged in a most adequate and efficient manner the duties which came within his purview and progress in sanitation was due very largely to his painstaking activities and sound work. Under the new *régime* the sanitary inspector fills an important place as heretofore, but another instrument has had to be fashioned to cope with the changing conditions of public health administration. The newer preventive medicine implies many matters of intimate and personal contact with women and children. "The mother" it has been well said, "is the pivot of public health" and the nurse by sex and training furnishes the ideal medium through which the mother can be approached with advice and instruction. It is not surprising, then, to find that the public health nurse is now definitely accepted as an important link in the modern organization for the promotion of the public health.

The Functions of the Public Health Nurse.

The public health nurse may be employed by central government, local body, voluntary organization or private employer.

She may undertake all or any of the duties coming within the following categories: (i.) Antenatal care; (ii.) maternity and infant welfare, including supervision of midwives and inspection of maternity hospitals; (iii.) child welfare, including both the preschool and the school age; (iv.) industrial hygiene; (v.) communicable disease control; (vi.) public health education.

Her most important functions are to insure the health and well-being of the mother during her pregnancy and of the child during infancy, preschool and school ages.

The Training of the Public Health Nurse.

There has been much controversy in the past as to whether the public health nurse must of necessity be the graduate of a hospital training school. The question may now be regarded as settled and both English and American authorities agree that the duties of a public health nurse are best carried out by a woman who has had hospital training. While women of outstanding ability may become leaders in this sphere of preventive medicine without the basic training, it can safely be said that they achieve success in the face of a very definite handicap and that they would have been even more useful in their chosen vocation if they had been equipped with a more solid foundation of knowledge. The public health nurse has to supervise the work of nurses and midwives and there are strong objections to employing in positions of authority persons who do not possess the basic training of those whom they are called upon to control.

It is generally conceded that hospital training is not of itself a sufficient preparation for the public health field and that a further period of specialized training is required to fit the public health nurse for the responsible duties which fall to her lot. A postgraduate course in preventive medicine gives a poise, a sense of relative values, a breadth of vision, which otherwise can be obtained only by the hard and at times painful knocks of experience. The school of

experience has undoubtedly produced many fine graduates, but its method of instruction is slow, wasteful and expensive.

The Organization of the Work of the Public Health Nurse.

Public health nursing is of very recent origin being indeed still in the formative stage, consequently hard and fast rules cannot yet be laid down for its practice. Two matters in particular in regard to which considerable differences of opinion exist, are whether the public health nurse should endeavour to cover the whole range of preventive medicine or should limit herself to some specialty and whether she should or should not undertake actual bedside nursing in addition to the teaching of preventive medicine.

There is no need to go outside New Zealand to find examples of the different schools of thought. At one extreme there is the district nurse who works amongst the Maoris as a community nurse, combining bedside care and health teaching; at the other there are the antenatal nurse, the Plunket nurse and the school nurse who are specialists concentrating on one particular aspect of preventive medicine.

It is the opinion of competent authorities that the combination of preventive and curative nursing gives the best result, but as the nurse working in the dual capacity can adequately serve only some two thousand people, it is obvious that for many years to come universal adoption of this system is impracticable on account both of expense and lack of trained personnel. Under these circumstances it is not suprising to find that there has been a distinct tendency amongst departments of public health to leave routine bedside nursing to voluntary organizations and to use the more fully trained public health nurse for educational and instructional purposes. The nurse freed in this way from the necessity of giving bedside care, may work either as a generalized nurse dealing with all aspects of preventive work in a circumscribed district or as a specialized nurse confining her attention to some particular phase of public health in a wider area. Each system has its advantages and disadvantages. The generalized public health nurse is particularly well adapted for rural communities, while the specialized public health nurse is seen to best advantage in towns. Toronto, however, is an instance of a large city with a most excellent generalized public health nursing service, which may well serve as a model for other communities.

The generalized system has certain very definite advantages which are as follows: (i.) It affords the closest possible contact between the nurse and the residents of the district in which she is working; (ii.) it insures the coordination of all public health activities in the one area; (iii.) it gives the nurse a diversity of interest which is very desirable.

The Public Health Nurse in New Zealand.

There are at present at least two hundred women engaged in public health nursing in New Zealand in the employ of the State, local bodies, voluntary organizations and private employers. Additional details concerning these nurses are set out in the table below:

In addition there is a miscellaneous group of some twenty or thirty nurses employed by hospital boards, voluntary organizations, such as the Red Cross Society and the St. John Ambulance, religious bodies and industrial concerns who undertake public health nursing of various types including in some cases bedside care.

It will be seen then that New Zealand is reasonably well supplied with public health nurses so far at least as mere numbers are concerned. Lack of proper training, however, to a certain extent hampers them in their usefulness. The extreme degree of specialization again which is found even in rural areas, is wasteful of effort and leads to incoordination with definite overlapping of function in some directions and failure adequately to cover the ground in others. In the near future it is hoped to remedy both these faults. Preliminary arrangements have been made to provide a proper course of instruction in public health nursing in the Dominion and when the facilities for training are available the Department of Health intends to accept as recruits for field work only nurses who have taken this course. The Department proposes

PUBLIC HEALTH NURSES IN NEW ZEALAND.

Designation.	Employer.	Number.	Whether Specialized or Generalized.	Duties.
Nurse Inspectors	Department of Health.	8	Specialized.	Supervision of midwives, inspection of private hospitals.
District Nurses	Department of Health.	21	Generalized.	Preventive and curative nursing amongst Maoris.
School Nurses	Department of Health.	32	Specialized.	Medical inspection of school children; "follow up" of cases requiring treatment; health education.
Antenatal Nurses	Department of Health.	6	Specialized.	Examination of the expectant mother; the giving of instruction and advice and arranging for such treatment as is necessary.
Plunket Nurses	Plunket Society.	115	Specialized.	The giving of advice in regard to the feeding and care of infants.

also to undertake an interesting experiment with a view to determining the value of the generalized system of public health nursing for New Zealand rural conditions. The intention is to select a compact area with a population of some 50,000 people and to staff such area with a full-time medical officer who shall act both as medical officer of health and as school medical officer, a sanitary inspector and a sufficient number of public health nurses. The nurses are to be located in different parts of the district and will undertake generalized duties. The demonstration will thus follow closely the local health unit idea which is gaining ground steadily in America.

Summary and Conclusions.

1. The public health nurse is an integral part of the public health machine. She is the connecting link between the public health administrator and the home.

2. The duties of a public health nurse are best discharged by a woman who is the graduate of a hospital training school and is the holder in addition of a certificate in midwifery and a qualification in public health nursing.

3. The public health nurse works to best advantage as a community nurse, undertaking both preventive and curative nursing in a restricted area.

4. Until adequate funds and trained personnel are available to permit the adoption of this system of combined duties, the public health nurse in the employ of official agencies should be used primarily for preventive nursing and all that is implied thereby in the way of health teaching.

5. The public health nurse engaged in preventive nursing may undertake specialized or generalized duties. Each system has its advantages and disadvantages. The generalized system, however, has certain obvious advantages and is particularly well adapted for rural areas. It prevents much incoordination and is, therefore, economical in regard both to money and to effort.

DR. ADA PATERSON (Director of School Medical Service, New Zealand) said that in New Zealand they had twelve school medical officers and thirty-two school nurses; they were, therefore, comparatively well off for nurses. If possible the school medical officer had two nurses, one of whom preceded the former and made a preparatory survey seeing that all was ready for the visit. Improvement had resulted from the employment of school nurses; as a result of treatment 80% efficiency was attained and in selected areas even 90%. The personality of the nurse counted most of all. Training was essential, but the nurse should not be too long in qualifying, though the wider the scope of the training, the better. It was difficult to distinguish between junior and senior nurses in remuneration and in duties. The scheme for the public health nurse outlined by Dr. Harvey Sutton would obviate this difficulty. Treatment of the preschool child had already begun in New Zealand on a definite basis, beginning with the *Kindergarten*. Extra nurses would be needed. In New Zealand they had an advantage as compared with New South Wales, in that this work was controlled by the Health Department and not by the Education Department. She agreed that cadet nurses taken on after completion of their training would be a good scheme. She agreed that a scheme of training was essential for the public health nurse of Australia and New Zealand.

DR. P. T. S. CHERRY (Port Adelaide) asked if it were true, as Dr. Harvey Sutton had said, that 37·5% of Australian children were found to have defects. He thought that searching for focal sepsis was overdone in schools, for example, the recommendations for tonsil enucleations. Dr. Harvey Sutton had stated that throat and nose defects were present at school entrance. He would like to ask were the 37·5% of the diseases that were encountered, contracted before attendance at school commenced; this did not seem probable. Speaking personally his own children had not contracted any disease till they attended school. He would also like to know how the school nurses got into the homes; often their visits were resented. He also asked whether children who had been in contact with others suffering from infectious disease were prohibited from attending school and restricted in their ex-school activities, such as visiting the cinema. He had noticed many cases of lack of control along these lines, for example, the schools were closed and the cinemas remained open.

DR. G. HALLEY (Chief School Medical Officer, South Australia) held that it was an advantage for the school nurse to visit the school with the school medical officer. To be at the actual examination saved time and made for efficiency. The medical officer could examine twenty to thirty children more a day if assisted by a school nurse than if working alone. Subsequently the nurse followed up the children, visiting them in their homes. She was also given special duties, such as swabbing in diphtheria, vaccinations and the like. She agreed that there should be some special training for public health nurses and that the Royal Sanitary Institute course was not really suitable.

DR. HARVEY SUTTON in reply noted that there was agreement in regard to the need for public health nurse training. The meeting should recommend that a definite course should be outlined for this training in Australia and New Zealand. In Australia the experience was that specialized nursing service should be utilized in metropolitan and urban areas. Medical work had become so wide in scope that specialization was essential.

In reply to Dr. Cherry he said that it was true that over 30% of medical defects were found in schools, but this included defects of vision. In connexion with focal sepsis he instanced one high school in Sydney with 420 boys of whom 111 had been operated upon for tonsils and adenoid vegetations. This was in accord with the standard of the profession before the department took control. The department could not alter, but must follow the standard adopted by the profession. The school nurse went to the home to help; she had no legal powers, but tact gained for her an entrance into almost all homes and they got all the information they needed. In New South Wales contacts were prohibited from attending picture shows in the presence of infectious disease epidemics, but the law was difficult to enforce.

In conclusion he moved a motion to appoint a small committee to look into the matter of the training of the school and public health nurse. Dr. M. H. Watt, Dr. G. Halley, Professor C. E. Hercus and Dr. Harvey Sutton were appointed members of a committee to draw up a resolution to submit to the general meeting of Congress.

SECTION VII.—OTOLOGY, RHINOLOGY AND LARYNGOLOGY.

NEURO-OTOLOGY.

By ROBERT PULLEINE, M.B., Ch.M. (Sydney).
Adelaide.

So many workers have contributed to neuro-otology as we know it today that it would be compiling a long roll of honour merely to give their names.

Just as in the evolution of the familiar wireless set, the fundamentals are the accumulated scientific wealth of centuries, while the working parts are

the contributions of many workers. In the 'forties of the last century Flourens and Purkinje started to build our neuro-otological set from the experimental side, then Menière contributed from the clinical side and it is within the lifetime of some of us that Goltz in 1870 acting as the great activator by his semi-circular canal theory definitely completed the foundations upon which our present knowledge has been erected.

Amongst the great number of workers, experimental and clinical, who have built up the science in the last forty years must be mentioned Ewald, Hoegyes and Bárány. These men certainly utilized and extended the work of others, but they got the set to work.

Bárány, assisted by the whole strength of the otologists in Vienna, was able between 1900 and 1916 to give us the science as we now have it.

Singularly enough, during the same decades Ramon y Cajal had been demonstrating the vestibular fibres from vestibule to cerebellum and Bolk elucidated cerebellar localization, thus contributing largely to one of those apparently sudden advances in science with which we are familiar.

Bárány's book appeared in 1907 and in 1915 he was awarded the Nobel Prize.

Meanwhile American investigators and otologists had set to work whole heartedly and extended the clinical scope of the new discoveries and it is due to the energy and singleness of purpose of Isaac Jones and his collaborators that we have today "Equilibrium and Vertigo," a unique and remarkable work which for the last decade has been a true help and *vade mecum* for all English-speaking neuro-otologists.

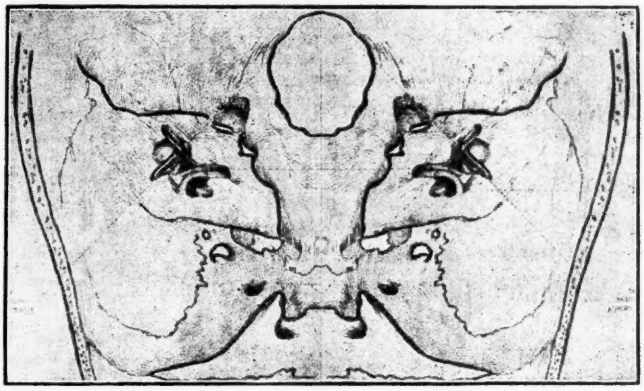

FIGURE Ia.
Base of Cranium Showing Orientation of Semicircular Canals.
(From Spalteholz.)

Since its publication, however, there has been a vast amount of work done on the experimental side, especially by the Utrecht School of which Magnus is the chief exponent. Their experiments on decerebrate animals show that the quick component of nystagmus does not arise from cerebral impulses, but rather that the impulse originates in the immediate neighbourhood of the nucleus concerned in the slow movement.

This concept of the origin of the quick movement explains our experience better as regards disease, shock, anæsthesia, that is where the conjugate deviation and caloric reaction of the eyes are retained, while the quick component disappears, than if we assume the existence of a supranuclear deviation centre for which there is no anatomical basis.

Magnus in his *"Körperstellung"* has also shown that the cristæ of the semi-circular canals are much more resistant than the maculæ of the sacculus and utricle and that their reflex is retained after the otolith membranes of the maculæ have been annihilated by centrifugalization of the laboratory animal at 1,000 revolutions a minute. Magnus regards the cupulæ of the cristæ as a damping mechanism controlling the continuous action of the cristæ by rising and falling according to position, in the same way as the otolith membranes control the maculæ of the sacculus and utricle.

Maxwell's recent monograph shows well the activity from the American side.

Some of the important points it elucidates are the results of injury to the cerebellar and the ipsilateral distribution of the cerebellar fibre tracts with the consequent ipsilateral effects on the body.

In order to visualize properly the exterioreceptive paths it is necessary to follow them from their origin to their destination.

Figure Ia will show the position of the semi-circular canal system in the cranial floor and also that the posterior and superior canals are contralaterally paired.

The terms horizontal and vertical apply to the position of the canals in the erect position; when the subject lies down or leans forward their horizon is reversed, the horizontal becoming vertical and the vertical horizontal.

The hair cell of the *crista ampullæ* projecting into the endolymph, is the beginning of all things as regards reception. The ultimate endings of the vestibular nerve begin around the nucleus. The fibres from all the cristæ as well as the maculæ of the utricle and saccule pass in two bundles to the vestibular ganglion of Scarpa in the depths of the internal auditory meatus. There the vestibular nerve is relayed and runs with the cochlear portion to form the eighth nerve.

The vestibular nerve, about 12·7 millimetres (half an inch) long, joins the brain stem at the junction of the *pons* and medulla. There it has been proved (Ramon y Cajal) that a divarication takes place: the fibres from the horizontal canal enter Deiter's nucleus in the floor of the fourth ventricle and after relaying there division takes place, one branch going to the posterior longitudinal bundle and another *viâ* the inferior cerebellar peduncle to the cerebellar nuclei. On the other hand the fibres from the vertical canals ascend in the *pons* to an undetermined level where they too divide; one branch goes

to the posterior longitudinal bundle, while the other, traversing the middle cerebellar peduncles, goes to the roof nuclei of the cerebellum. Following them from this point we find that the horizontal canal fibres, ascending in the posterior longitudinal bundle, link up with the nuclei of the third and sixth nerve, while the vertical canal fibres connect with those of the fourth and sixth, thus forming the vestibulo-ocular tract.

The fibres which traverse the inferior and middle cerebellar peduncles, relay in the cerebellar nuclei, pass on to the brain stem *viâ* the dentate nucleus and cerebellar peduncles forming the vestibulo-cerebellar-cerebral tract. In addition to this the vestibular system through Deiter's nucleus and the posterior longitudinal tract links up with the spinal cord forming the anterior and lateral vestibulo-spinal tracts.

These three tracts may be regarded as the neuro-otologist's main roads. They all govern equilibrium, any two of them will function to maintain equilibrium after the vertigo and disturbance caused by destruction of the remaining one has subsided.

To take a familiar example, in tabes the vestibulo-spinal tract is interfered with, while the vestibulo-ocular and vestibulo-cerebellar - cerebral tracts are normal. Closing the eyes and thus closing the vestibulo-ocular tract accentuates the ataxy.

The sign posts to these three roads are vestibulo-ocular nystagmus, vestibulo-cerebellar - cerebral vertigo, vestibulo-spinal falling.

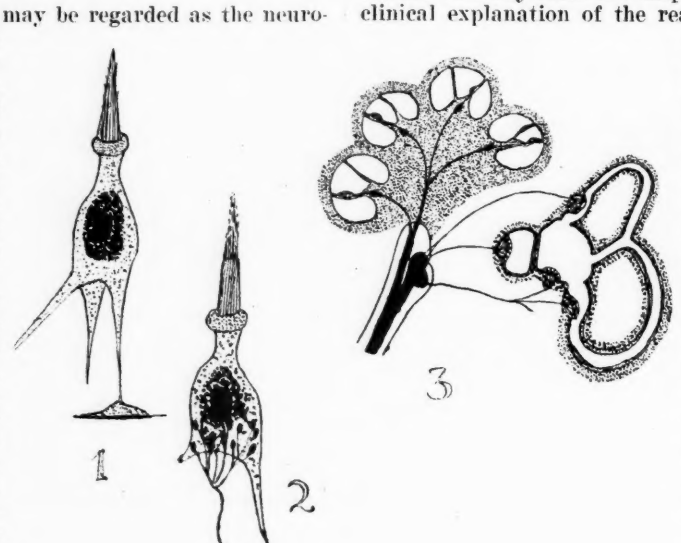

FIGURE I.
Ciliated Cell from the *Crista Ampullaris* of a Semicircular Canal.

FIGURE II.
Nerve Terminal in a Ciliated Cell of the *Crista*.
(After Poirier.)

FIGURE III.
Acoustic Nerve (after Duval). Showing terminations in cristal branches to utricle, saccule and semicircular canals shown converging to Scarpa's ganglion. Branch to horizontal canal not shown.

The vestibular nystagmus we have to consider is the rhythmic form with its two components, the slow vestibular and the rapid so-called cerebral.

The nystagmus in this paper is named from the slow component following the recommendation of the Brisbane Congress, 1920.

Nystagmus occurs only when the usually perfect balance of the vestibulo-ocular centres is disturbed. Hence we do not find spontaneous vestibular nystagmus normally and it is doubtful if the slight rhythmic movement observed occasionally in healthy people in extreme abduction can be classed as vestibular.

Ewald, as far back as 1892, demonstrated that definite eye movements were associated with endolymph movement, but Hoegyes was the first to enunciate a law which is as follows:

When the centre of one side is stimulated from the vestibular apparatus, the adductor ocular muscles of the same side and the abductor muscles on the other side contract, resulting in a slow conjugate movement of the eyes in a direction away from the stimulated centre.

This is the slow component of nystagmus and is, of course, only true of the primary nystagmus after stimulation (for example by hot water douche). The primary nystagmus of depression (cold water) is reversed as in the case of the after (secondary) nystagmus of rotation.

I am leaving out of discussion the quick component after which nystagmus is generally named.

The movement of the endolymph in a canal is obviously either toward or away from the utricle and the cilia of the cristæ will be turned either toward or away from the ampullated end. For the clinical explanation of the reactions it is usual to consider the hair cells as projecting free into the endolymph. What part the cupula plays is uncertain, but if as figured by Poirier it is a canalized cap into which the hair cells fit, we shall have to change our conception, since it is the varying degree of pressure exerted by this cap on the hair cells that Magnus considers of so much importance in controlling the continuously acting crista.

Ewald demonstrated that in the horizontal canal movement of the cilia in the direction of the utricle, will stimulate, while movement toward the non-ampullated end will inhibit the centre. The reverse obtains in the vertical canal system, stimulation on ciliary movement toward the non-ampullated end and inhibition on ciliary movement toward the utricle being the rule.

Recently Maxwell and Huddlestone found that while stimulation of a horizontal ampulla evoked a strong contraction of the ipsilateral *rectus internus* and the contralateral *rectus externus*, there was at the same time a relaxation of the opposition *recti*. Simultaneously there was weak contraction of the superior and inferior *recti* and the two obliques of both eyes. These authors point out that the small, simultaneous contractions of the four muscles just mentioned provide a vertical axis upon which the

eyeball rotates. In other words these four act as fixation muscles. These writers suggest that some of the abnormal responses to horizontal rotation seen in clinical cases are due to the inaction of one or more of these fixation muscles.

The linking up of the laws of Hoegyes and Ewald then gives us the key to the nystagmus, as we only have to visualize the paths (see Figures IV, V, VI and VII) to realize what will happen.

Vestibular vertigo is the subjective sensation of disturbed relationship of the individual to space. It can be experienced in its mildest form by rapidly spinning round as in a *pirouette*. It is a cerebral disturbance and its reaction movement, past pointing, is also of cerebral origin.

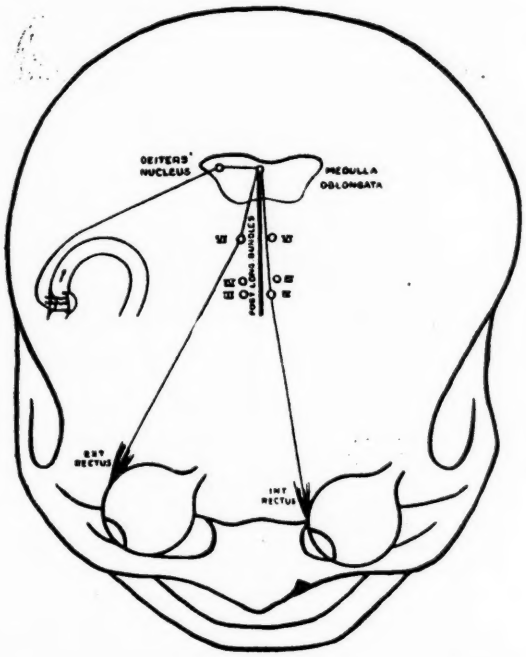

FIGURE IV.
Vestibulo-Ocular Tract (Producing Nystagmus) of Horizontal Canal Fibres (Current Away from Ampulla). Eyes drawn in direction of endolymph movement. Horizontal section of head.

We have seen that while certain fibres of the vestibular nerve join the posterior longitudinal bundle and become vestibulo-ocular, others branch off and reach the cerebellar nuclei, the horizontal canal fibres *viâ* Deiter's nucleus and the inferior cerebellar peduncles, the vertical canal fibres, on the other hand, *viâ* the pons and middle cerebellar peduncle. These are the two paths along which stimuli pass to produce vertigo (see Figures VIII and IX). Vertigo occurs in the planes of the canals horizontal, frontal, sagittal and can readily be produced artificially by rotation or caloric tests. In whatever way and whatever plane it is produced, it is always in the direction opposite to the endolymph movement. Past pointing, the reaction movement, is always in the direction of the endolymph movement and opposite to the vertigo.

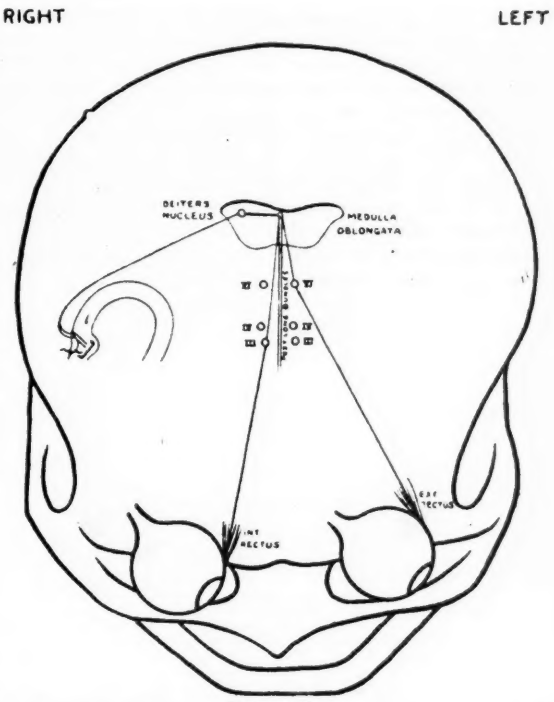

FIGURE V.
Horizontal Canals, Current Toward Ampulla. Eyes drawn in direction of endolymph movement.

VESTIBULAR NYSTAGMUS

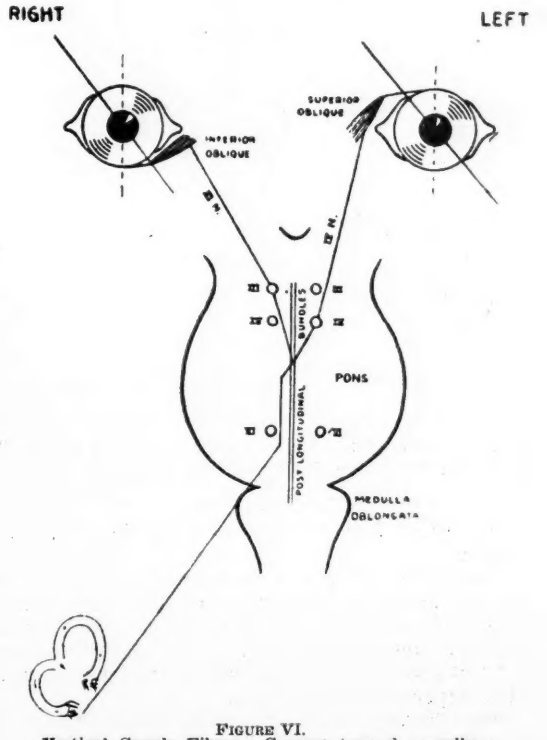

FIGURE VI.
Vertical Canals Fibres. Current toward ampulla.

Bárány's great service to neurology was the recognition that past pointing is not an eye reaction like von Graefe's sign, but is due to a vestibular reaction and independent of the eyes and normally inducible in blind people. One can imagine the thrill that this tremendous discovery must have given him, a discovery the significance of which is yet not fully realized, but which is even now enabling us to test, as it were, the wiring of the vestibulo-cerebello-cerebral tract and localize short circuits or fusing with surprising accuracy (see Figures X and XI). The pointing tests so admirably set out and

EQUILIBRIUM AND VERTIGO

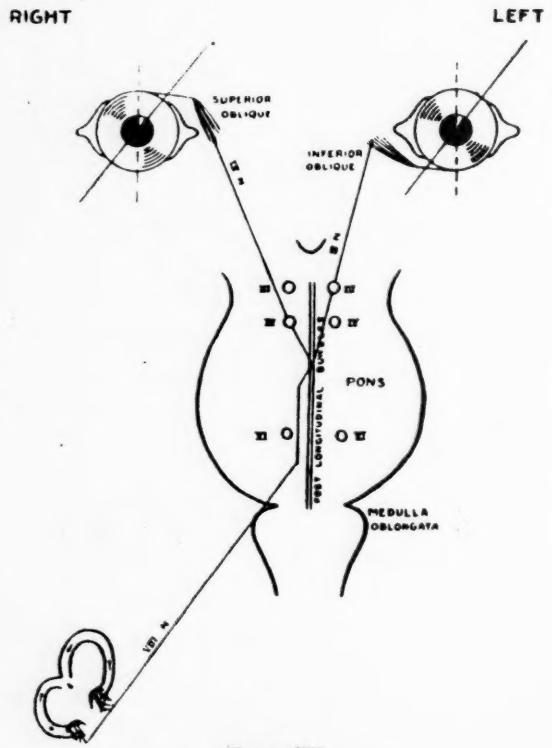

FIGURE VII.
Current away from Ampulla.
(From Jones and Fisher, "Equilibrium and Vertigo.")

described by Jones and Fisher require graphic demonstration and cinematograph records are being prepared for presentation at the Congress.

VESTIBULAR TESTS.

The tests I have used are entirely the rotary and caloric.

Though the rotation tests are useful and interesting, all necessary information can be obtained by a careful observer with water at 20° C. (68° F.) used from a common douche can. Probably no important test gives such a great deal of information at so little expense for apparatus.

Our Bárány chair was made locally from the pattern in Jones and Fisher's work and improved by the addition of ball bearings and band brake. The model has been adopted by the Commonwealth Aviation Department and the Adelaide Hospital.

In normal cases I find that the reaction time for appearance and duration of nystagmus and vertigo closely follows that given by Jones and Fisher, but that there is a great variation in the discomfort as evidenced by nausea and vomiting.

The Tests.

After the history has been taken, neurological data obtained and functional eye and ear tests recorded, the first inquiry comes under the heading of spontaneous. Having determined and recorded the presence or absence of spontaneous nystagmus, past

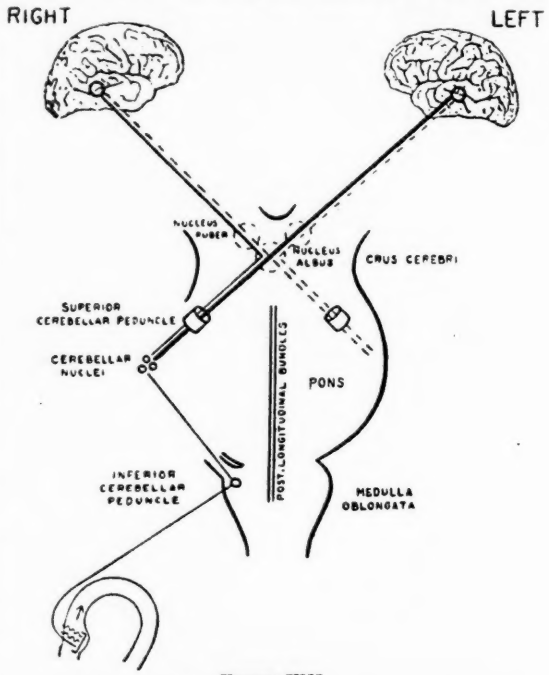

FIGURE VIII.
Vestibulo-Cerebello-Cerebral Tract for Horizontal Canal Fibres, Producing Vertigo.

pointing, falling, the turning (cinematograph) test is proceeded with. Ten turns to the right for nystagmus with twenty turns for past pointing repeated on the left side, give an indication whether rotation in other directions will be needed. The caloric test (water 20° C. or 68° F.) gives more exact unilateral information. In the caloric test I have found it a useful method to douche the ear in a patient lying down, the head about 60° back, to take the reading for the nystagmus and past pointing and then with the patient sitting up and the head 30° forward, to take the readings of the vertical canals. This obviates a good deal of the unpleasantness of the test. A supply of hot water is ready to control a too severe reaction should this occur.

Practical Application of the Tests.

During the past six years I have applied the vestibular tests to all patients referred to us for disturbances of equilibrium.

The reactive and non-reactive values of the tests have come out very clearly.

Although my experience has not been great, all of it being obtained in private work, a considerable number of cases has been recorded.

The following facts have presented themselves.

Reactions.

Labyrinthine conditions can be clearly distinguished from acoustic tumours.

Acoustic tumours have a well defined syndrome.

Cerebellar neoplasms are capable of being differentiated.

Toxæmic conditions from tobacco and dental infections forming the bulk of cases tested show interference with normal vertigo and past pointing.

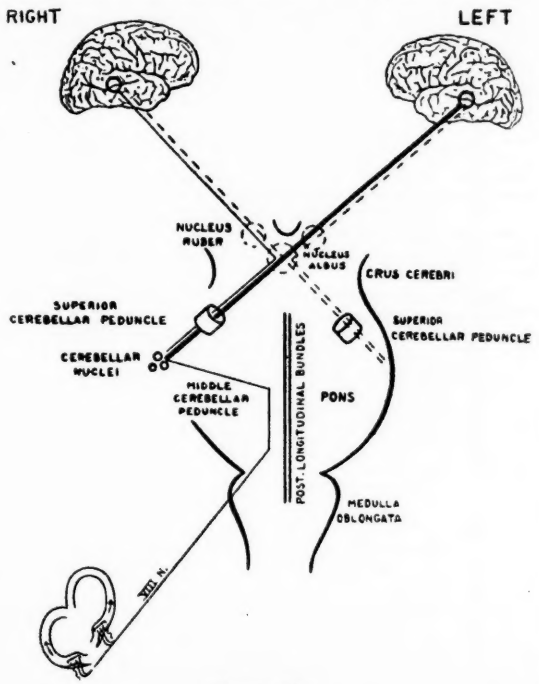

FIGURE IX.
Vestibulo-Cerebello-Cerebral Tract for Vertical Canals Fibres.

Absence of Reaction.

Functional (hysterical) forms are rare and exhibit great variability in reaction on repeated tests.

Spontaneous vertigo occurring in eye conditions, for example considerable anisometropia where *amblyopia ex anopsia* has not evolved and heterophorias, especially vertical, can be eliminated by the vestibular tests.

The cases cited are three of cerebello-pontine angle tumour, one of cerebellar neoplasm, one of toxæmia of dental origin, one of toxæmia following tobacco poisoning.

CASE REPORTS.

Cerebello-Pontine Angle Tumour.

This case is given in full as it was observed over several years, but it had passed beyond surgical help when the condition was recognized.

C.B.M., a banker, aged thirty-seven years, was seen on May 12, 1921.

In 1907 he had double vision, he was given glasses and had an operation on his nose on account of total deafness in the right ear.

In 1910 he complained of aching eyes and intermittent diplopia, but no headache. He had 15° of hyperphoria in the right eye.

In 1915 he had headaches for six weeks, hyperphoria 20°, pseudo-optic neuritis; his vision was $^{10}/_{10}$ in each eye. Glasses had been tried and failed to remove or improve the diplopia. The deafness was persistent and complete.

EQUILIBRIUM AND VERTIGO

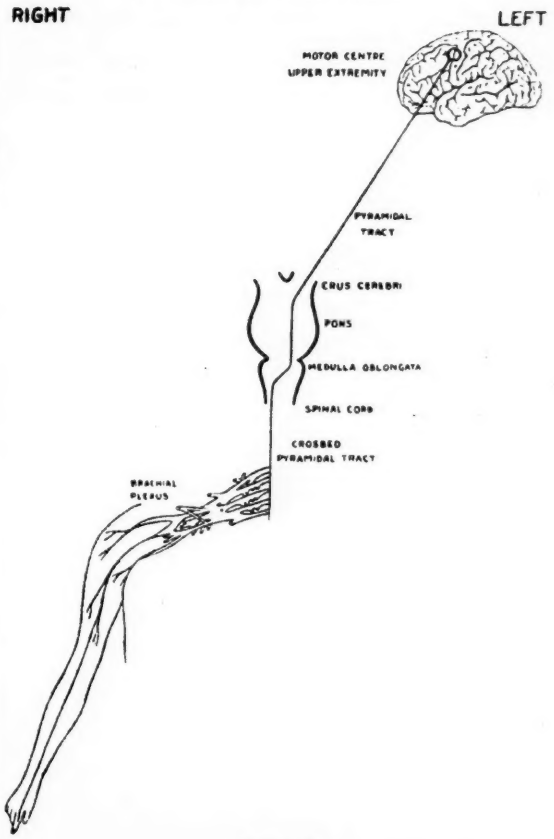

FIGURE X.
Pyramidal Tract Becoming the Crossed Pyramidal Tract ("Power" Tract.)

In 1921 he remembered falling on several occasions during the preceding ten years, once from a motor bicycle, once in the strong room and at other times since January, 1920.

Several times on rising from a chair he had felt a tendency to fall and had had to sit down. His frontal headaches were not severe. For more than a year he had had unsteadiness in walking, worse at night and had been liable to collide with people. He had a numb feeling in the back of his throat when he felt giddy.

The right palpebral fissure was larger than the left. His pupils were equal. There was slightly defective abduction of the right eye. Homonymous diplopia was determined with the right image higher than the left. He had distinct choked discs going on to atrophy on the

was facial paralysis. The right ear was completely deaf and was lateralized to the left. The left ear was unaffected.

The spontaneous vestibular tests revealed nystagmus horizontal to the right on looking both to the right and to the left. On looking up there was clockwise rotary nystagmus. On looking down there was anti-clockwise rotary nystagmus. Falling took place to the right. Past pointing; on the right side two to the left; on the left side one to the right. Romberg's sign was positive. Douching with water at 20° C. on the right side induced nystagmus clockwise to the left; with the head held back at an angle of 60° there was astigmatism horizontal to the left.

The past pointing test was applied; the right touched, but at the left side it was two to the right.

POINTING TESTS OF BARANY

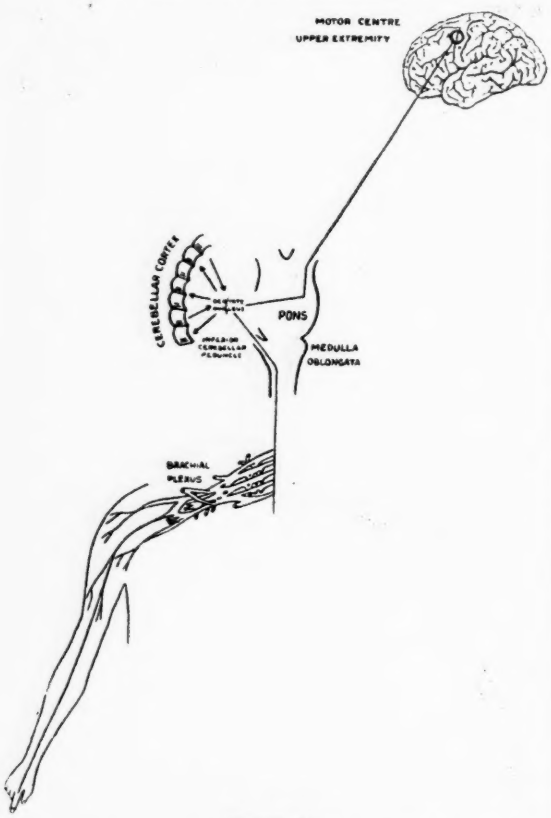

FIGURE XI.
Cerebro-Cerebello-Spinal Tract ("Accuracy" Tract).
(From Jones and Fisher, "Equilibrium and Vertigo.")

right side. There was amaurosis on the right side. He had vision on the left for large objects. On the right side there

Douching out the left side induced rotary nystagmus to the left. With the head at 60° backwards, horizontal nystagmus was to the left.

With the past pointing test the right touched but the left passed to the left (the amount was not recorded).

These data indicate the presence of a tumour of the vestibular nerve on the right side. It has been of excessively slow growth, the deafness dating back to 1907. By 1910 there was definite interference with the vestibulo-ocular tract as shown by the interference with the fourth nerve and resulting hyperphoria and double vision. In 1915 this interference had increased and optic neuritis was definitely present, although in the presence of normal vision it was wrongly diagnosed as pseudo-neuritis. The neoplasm is now exerting pressure on the sixth and ninth nerves and the front of the cerebellum with resulting muscular asynergy of the right side.

This long-standing example of cerebello-pontine angle tumour on vestibular tests being applied, left no room for doubt as to its character. Between 1907 and 1921 the patient was seen by several observers, having operations for deafness and corrections for his vertical diplopia. When he was brought to be tested the situation of the lesion was not hard to find, coupled as it was with all the classical signs and well developed facial paralysis.

Dr. Newland operated on the patient. The tumour was found to have invaded surrounding tissues so extensively that removal was impossible.

Cerebello-Pontine Angle Tumour.

H.H., aged thirty-four years, gave the following history. Four years ago he had slight deafness which has been getting worse. It began in the right ear. Tinnitus was absent. There was giddiness on raising the eyes suddenly; he was unsteady especially when walking in the dark. He walked to the left and had intense waves of headache across the front, spreading to the back of his neck. There was projectile vomiting; he was often nauseated. In eating he chewed on the left side.

His sight was defective at night; there was blurring lately in the day time and diplopia recently.

His headaches were frequent and severe. His memory was failing. His smell and taste were defective. His weight and strength were failing. There was general muscular lassitude with no definite localization. His psyche was changed and irritable.

There was definite but not complete deafness of the right ear and lateralization to the right for high and medium tones. The cochlea was still functioning though defectively.

The left ear was normal.

Slight smoothing of face and droop of angle of mouth to the right were noted. He had a tendency to chew on the left side and his food collected between his right lower teeth and his cheek.

There was a subjective loss of taste of flavours. Well established optic neuritis was detected. His memory was defective for small and large affairs, names, localization of familiar objects and recently for self written documents. He was very irritable.

The vestibular tests yielded the following information. There was reversed horizontal nystagmus and vertical nystagmus. There was no spontaneous past pointing. No other spontaneous tests were made as he was in bed in hospital and for the same reason the turning test could not be applied.

In response to the caloric test reversed nystagmus to the right side, identical with the spontaneous nystagmus, was elicited. The left side was normal.

On the right side past pointing was absent in all directions. On the left side the response was normal for the horizontal and both vertical canals on that side.

A cerebello-pontine angle tumour of right side was diagnosed from the spontaneous and caloric symptoms.

An intracranial disturbance was well established four years ago; it was localized to the right side. The eighth nerve (vestibular part) was chiefly affected. Pressure or invasion effects were felt in the seventh and ninth nerves of the same side. Presence of vertical nystagmus with total absence of response from the semicircular canals on the same side pointed to some lesion affecting the vestibular nerve. There was absence of all signs or symptoms that could be referred to the cerebellum.

Dr. M. Scott undertook operative treatment on October 19, 1925. Bilateral cerebellar decompression was embarked upon. At the point when the posterior rim of the *foramen magnum* was removed, the patient ceased breathing and could not be restored.

At a *post mortem* examination, done under circumstances of exceptional difficulty, a tumour the size of a large walnut was found in the posterior fossa on the right side in front of the cerebellum. It was an œdematous encapsuled tumour with a nerve-trunk running through its surface.

(To be continued.)

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